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E. D. Nims Resigns As we go to press, we learn from newspaper dispatches that E. D. Nims has resigned as chairman of the Board of Directors of the Southwestern Bell Telephone company, with headquarters at St. Louis.

It is only in keeping with good business judgment that a man who has given the greater part of his life in building a great business organization, should arrive at a time when he should lay down the duties and responsibilities that are his, and spend the remainder of his years in the enjoyment of the fruits of his labors.

We are doubtful if there is another man in telephone work who is better known or more dearly loved than E. D. Nims. His early experiences in the Independent field, in Oklahoma where he organized the Pioneer Telephone company that afterward became a Bell subsidiary, gave him rare opportunity to view the telephone industry in a broader sense, perhaps, than almost any other man in high position.

It was this experience and this view that went a long way toward helping to work out the plan for eliminating wasteful competition in the telephone

business that was known as the "Kingsbury Commitment."

His sober judgment, coupled with a high sense of honor and a desire to deal justly with all men made his counsel much sought after in the solution of the many intricate problems that presented themselves in his own company and in the other telephone companies, both Bell and Independent, with which he had dealings.

We are not informed as to Mr. Nims's future intentions, but we do know that in anticipation of the day when he could retire from active business, he has purchased and improved a palatial country estate and we feel that it is no guess when we state that he and Mrs. Nims will soon be found "at home" to their many friends amidst the peaceful surroundings of such a home as is the dream of every man and woman at some time in life.

In the meantime, the Southwestern Bell Telephone company which he served so long and faithfully, first as president, and in later years as chairman of its board of directors will continue to prosper and stand as a monument to the ability and genius of one of industry's greatest men.

Proper Maintenance

"If winter comes, can spring be far behind?" Winter has come, though not very ferociously in the greater part of the country, and by the time this issue of TELEPHONE ENGINEER reaches its readers, though Old Man Winter may be taking a last fling or two at us, he will be on his way, and spring indeed will not be far behind.

There will be a great deal of work for telephone companies to accomplish during the spring, summer, and autumn of this year. There will be the regular routine of replacing decayed poles and cross-arms, straightening of poles that are leaning, repairing opens in cables, cutting out high joints, pulling up slack, re-stringing drops, replacing batteries, trimming trees, and dozens of other little things which need attention as the result of bad weather and storms during the winter season, at which time only the most temporary repairs are made.

Because there is work to be done in addition to repairs, many of the smaller companies are finding it necessary to make many improvements this year in order to keep up with the standard of service set by their larger brothers. Other companies, both large and small, have more construction planned for this year than in the last several years, chiefly because they only touched the surface of needed improvements last year, made timid by the world-wide depression and intending to wait until financial conditions improved.

Now, however, telephone men are realizing that their business changes only in a small degree, in relation to the depression in other businesses, and so are planning to catch up with modern methods and take care of needed construction and improvements while prices remain low.

The larger companies have long since found it a matter of economy to replace their open wire leads in the cities with all-cable construction. Not only is the original cost less, but the expense of maintenance is considerably reduced. This has been fully demonstrated over a period of years, but right now when lead covered telephone cable can be purchased at a lower figure than has ever been known, it seems that the smaller companies should take advantage of the opportunity to modernize their plants at a minimum of cost. With materials and labor at the present low figures one can actually write off considerably more plant than the amount needed to make the replacements.

The introduction of 24-gauge cable has proved a boon to telephone companies operating in the smaller towns. The substantial saving in cost and the greater ease with which the smaller cable can be handled have combined to make it very popular. The difference in resistance between the 22-gauge cable that has been standard for so many years and the 24-gauge cable, is negligible when applied to lengths of one mile or less.

The engineering features involved in cable construction in the small towns are just as important, though not so complex, as those of the large cities. Many small exchange owners put off their improvements from year to year because of a lack of proper engineering facilities. They do not seem to realize that there are a number of capable engineering firms whose services can be secured for such work at a nominal cost. In many cases the engineering departments of companies located in near-by cities will be glad to lend their assistance in making up estimates and laying out the work to be done.

We have in mind a number of small towns where the above plan has been carried through and the appearance of the outside construction is a joy to the owners and every telephone man who views them. It is not necessary to add that the service rendered under these improved conditions is likewise a joy to the patrons of the company whose foresight has led them to adopt up to date methods in plant maintenance.

State Conventions

As the spring months approach, we hear more of plans for the various state conventions. It is generally felt that this year's conventions will be of more than usual importance in guiding the telephone companies from the lower to the higher levels of prosperity. Companies wishing to take part in this upward progress—and are there any who don't—should plan now for an adequate representation at their own state conventions.

Keep Telephone Volume From Dropping

George A. Scoville Here Gives a Detailed List of Various Telephone Items and Concrete Suggestions Which Should Assist Telephone Men in Aggressive Selling Efforts and Intelligent Merchandising Efforts in Order to Keep or Increase Present Telephone Volume

The "Telephone" volume curve lags behind the "General Business" volume curve and this lag is from six to eighteen months, as is shown in the cut. The "General Business" volume curve dropped quite rapidly, has reached the bottom and is slowly starting upward, in my judgment. The "Telephone" volume curve is just really commencing to feel the results of the general business conditions. This is easily explained because the telephone is one of the last things that anyone will give up.

The telephone industry has, in spots, worked diligently to keep its volume up. Nearly every attempt has succeeded and some companies have even increased their volumes. This has been accomplished by strenuous and intelligent merchandising efforts.

Regardless of whether or not telephone companies do continue the application of aggressive selling efforts, the telephone volume will not drop as much as the "General Business" curve. However, the "Telephone" volume curve is now dropping and will continue to drop, even after the "General Business" curve has started upward, unless strenuous sales efforts are continually applied.

If there ever was a period when aggressive selling tactics and campaigns were essential for the telephone industry, it will be during the first half of the year 1932, because we are now experiencing the full effects of the depression as an industry.

The telephone business is about the best business in all the world. Let's keep it that way. The "Telephone" volume curve can be pushed upward more readily than the "General Business" curve. To accomplish this, telephone companies must keep on with their sales activities selling the various classes of service which they are able to supply. The commercial department has many types of service to sell or rent.

Here's a list which you can adjust to fit your own conditions.

Advertising: Directory, classified directory, classified index.

Amplifier service: Public gatherings, fairs, chautauquas, schools, hospitals, skating rinks, etc.

Amplifying sets: For the partially deaf.

Apartment house service: Vestibules, apartments, janitors, door openers.

Bank vault special lines: Emergency service in connection with holdups; safety telephones in vaults.

Battery feed trunks: For the operation of privately owned equipment on subscribers' premises, P.B.X. intercommunicating burglar alarm, thermostats, buzzer systems, etc.

Bells: Small extension bells; large extension bells; extension bells, or signals, under relay control.

Booths: For long-distance users; for noisy locations.

Burglar alarm service: Banks, insurance offices, stores, residences, etc.

Buzzers: Push button and buzzer wiring.

Code calling systems: Paging systems (audible radio type); code signal sending set, including signal control relay set; indoor signals (horns, bells, special gongs); outdoor signals (horns, bells); for P.B.X. and inter-communicating telephone installations in factories, department stores, hospitals, etc.

Coin box service: Public pay stations.

Cordless type switchboard: For small P. B. X. installations.

Credit bureau switchboards.

Directory listings: Extra names, extra listings, night and Sunday listings, classified listings, national advertising, local advertising.

Elevator telephones: For starters; for cars.

Extension telephones: Business residence, P. B. X., inter-communicating telephones.

Extension talking sets only: Desk, wall, hand set.

Extra length cords: For special telephone installations.

Fire alarm services: Alarm boxes, sprinkler alarm circuits, group ringing and common talking on firemen's lines.

Hand set telephones: Standard black finish, standard colors finish, special colors finish.

Hold-up alarm systems: Banks, insurance offices, stores, cafes, etc.

Intercommunicating systems: With trunk service; without trunk service.

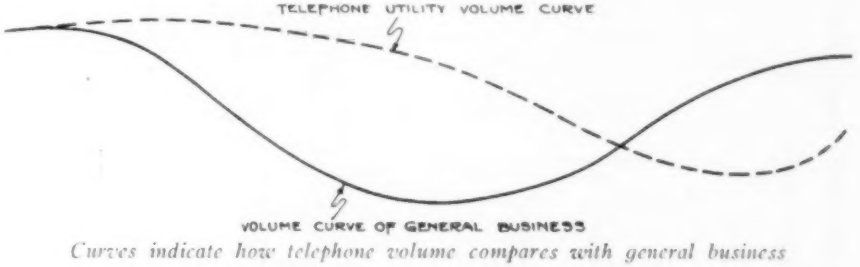
Jack and plug equipment: Surface mounting jack, flush mounting jacks, portable instruments.

Keys-switching: For switching a telephone to either of two lines; for switching a telephone to one of three lines.

Key cabinets: With lamp signals; without lamp signals.

Leased wire service: To Bell, Western Union, or Postal; to brokerage houses, banks, manufacturing concerns, dairy companies, seed warehouses, power companies, etc.; to local broadcasting stations.

Long distance trunk lines: Direct lines to toll board for heavy toll users.



Curves indicate how telephone volume compares with general business

Message registers: In connection with measured service lines.

Messenger service.

Operators' breast plate telephone sets: For heavy traffic lines, newspaper offices, department store, order departments, etc.

Order table type switchboards: Grocery stores, markets, etc.

Order turret type switchboards: Taxicab offices, credit bureaus, etc.

Outdoor telephone sets: Police (way side service, sheriff, telephones, etc.); taxicab, golf courses, etc.

Paging systems (radio): Hotels, barber shops, billiard parlors, skating rinks, garages, clubs, bus depots, taxi stands, hospitals, etc.

Program service (radio): Locally installed amplifiers for public schools, parochial schools, public and private institutions, hospitals, sanitariums, dance halls, skating rinks, etc.

P. B. X. switchboards: For factories, schools, hospitals, etc.

Push button and buzzer service: Offices, schools, taxicab stands, etc.

Receivers: Extra watchcase receiver, extra headband receiver—single or double.

(Continued bottom next page.)

"B" Operator's Telephone Grouping Circuit

Grouping Key Circuits and Their Purpose Which Is to Provide a Way for the "B" Operator to Operate the Entire Board from Any Position Explained by John H. Levis, Jr., Telephone Engineer, Rochester, N. Y., in the Seventeenth Installment of His Articles on Straightforward Trunking

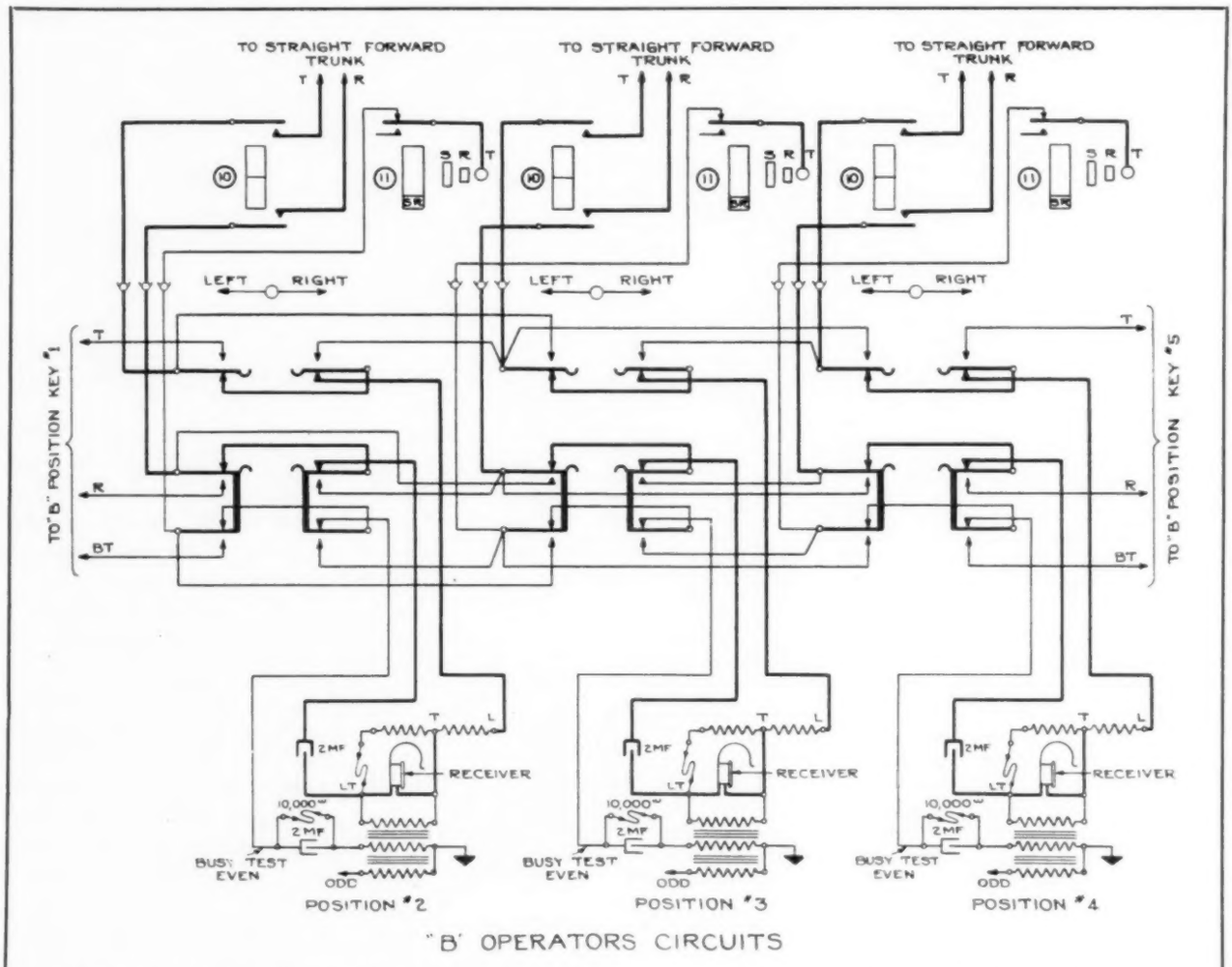
Every "B" switchboard is equipped with operator's telephone grouping keys. They are so arranged that one two-way locking key is located in each "B" trunk position and it is generally located in the uppermost central panel.

Associated with each position grouping key is a small designation strip marked right and left. This is to indicate to the "B" supervisor, operating the grouping key, which way to operate it. The key is so mounted that the cam handle operates in a horizontal plane which gives a visual indication as to its operated position, right or left.

The purpose of telephone grouping key circuits is to provide a way for one "B" operator to cover or to operate the entire "B" board from any one position to which she may have her telephone set connected.

During Light Day Traffic

The above condition only would hold true when the "B" incoming traffic is



"B" OPERATORS CIRCUITS

A study of this circuit diagram will disclose many possible combinations of grouping key circuits that can be obtained

Reservoir tell-tale circuits and equipment: For pumping plants—public or private.

Secretarial service: Doctors, undertakers, etc.

Special finish telephones.

Special trunk lines and equipment for telephone solicitation campaigns.

Special arrangements for reversed toll charges.

Switching keys: See keys, switching.

Telektor systems: Remote control radio systems for homes, clubs, schools, hospitals, etc.

Telegraph loops: Leased wire service by Western Union, Postal, Bell, or another telephone company; printer telegraph service to newspapers.

Teletypewriter service: A. T. & T., Bell, Western Union, Postal; page type machines (receiving only, sending only, or sending and receiving); tape type machines (receiving only, sending only, or sending and receiving).

Transmitter cut-outs: For desk telephones.

Vault telephones: See bank vault special lines.

Visual signals indicating incoming calls: Continuous; non-continuous.

Wiring plans: Building cabling, building wiring, and building terminals; underground entrance leads (business, residence).

very light. The "B" operator's telephone cord would have to be increased in length so that she could readily walk from one end of the "B" board to the other in handling incoming calls in the various positions. The grouping keys are used in the daytime when the incoming traffic is light and are operated so that one "B" operator can operate the incoming trunks in the position to which her telephone set is connected and also the positions to her left and right or 120 incoming trunks. This is the general scheme of grouping used for the entire "B" board during light day traffic.

It should be mentioned that the grouping key system as outlined is only used with the Straightforward Trunking System when the manual cut-in key circuit is used. When the "B" positions are operated on the automatic cut-in basis, it is obvious that a system of multiple position grouping cannot be used. With automatic cut-in the "B" operator has no control over the cutting-in of her telephone circuit on the trunk, therefore should one or more calls come in at the time they would be connected together. This would not be satisfactory. The grouping and splitting key circuit for use with automatic cut-in will be described in a later issue of TELEPHONE ENGINEER.

Receiving Part of Circuit

The diagram of the grouping key circuit shows three keys of the two-way locking type to which are connected the secondary or receiving part of the "B" operator's circuit. The primary or transmitting circuit has been omitted for simplicity. The busy test circuit is also shown because this part of the operator's circuit must be grouped the same as the talking circuit. The even busy test lead is shown. The odd busy test lead is omitted for simplicity. The odd busy test lead switches the same way as does the even lead.

The diagram also shows the portion of the straightforward trunk that is connected to the "B" operator's talking circuit and busy test circuit to the tip of the plug circuit.

In checking the grouping key circuit, it will be noted that the key in the position which is occupied by the operator is left in its normal or upright position. The keys of all unoccupied positions on either the left and right that are switched to the occupied position will operate in the direction toward the occupied position.

Operating Key to Right or Left

For example, assume that position number 3 is occupied and positions number 2 and 4 are grouped with number 3. The key of position number 2 will be operated to the right and the key of position number 4 will be operated to the left. Above each key in the circuit diagram is a directional arrow and under each of the right and left notations are the springs of the key which operate accordingly.

When any grouping key is operated in either direction, the complete operator's circuit is removed from the commons of the incoming trunk circuit of the position. This operation places the trunk commons with the operator's circuit of the normal grouping key. This is shown in the circuit diagram.

The main feature of this type of grouping key circuit is the key handle indication of direction and its flexibility in sectionalizing grouped positions in a non-interfering manner.

A study of the circuit diagram will disclose the many possible combinations of groupings that can be obtained.

ILLINOIS CONCERN TAKES GROUP LIFE INSURANCE FOR EMPLOYES

Nothing is too good for the employes rendering telephone service to the public in thirty Illinois towns is the opinion of the Illinois Southeastern Telephone company. In order to combat the fear and worry of the uncertainty of the future this telephone company has bought $325,000 worth of group life insurance for the benefit of its 250 workers.

The sale of such a large amount of insurance at this particular time is only one of the many encouraging indications that business is going on as usual in conservatively managed concerns. The psychological effect on the morale of the telephone people involved is still further favorably increased because the company is paying a large part of the premium for this form of protection.

One of the factors that is at the bottom of most old age diseases is worry. The old and familiar institution of life insurance is one of the greatest enemies of "ole debbil worry." The worker who has made adequate provision for his family and his own future certainly has a big load off his mind.

A. R. Lumpkin, president of the Illinois Southeastern Telephone company, states that employes whose wage is less than $150 a month will be entitled to receive an insurance policy of $1,000. Those with salaries of $150 to $249 a month will be entitled to a policy of $2,000. Those who have salaries of $250 or over will be entitled to a policy of $2,500.

After five (5) years of continuous service the insurance will increase $100 per year to a maximum of $500.

The cost of the insurance is greater than the small contribution made each month by the employe., The telephone company pays the additional cost as well as pays the cost of administration, collection and accounting for the insurance plan.

Group insurance purchased by telephone companies promotes a friendly feeling within the organization. The telephone subscribers are directly benefited from the resulting increased efficiency of the organization. The effect of the entire movement deals a real blow to those who have any pessimistic views of the future of the telephone industry.

ASSOCIATED ADDS TWELVE WISCONSIN COMPANIES

The Public Service commission of Wisconsin has given Commonwealth Telephone company, Wisconsin operating unit of the Associated Telephone Utilities System, permission to acquire twelve separate operating companies. The following companies are included in the authorization:

Lac du Flambeau Telephone company, Marquette Telephone company, Nichols Telephone company, Sayner Telephone company, Three Lakes Telephone company, Adams County Metallic Telephone company, Bingham Telephone company, Delton Telephone company, Freeman Telephone company, Friendship Telephone company, Holton Telephone company, and Wise Telephone company of Birchwood.

These acquisitions constitute a further step in Associated Telephone Utilities company's program of consolidation of operating properties within each state area into compact operating units, thus obtaining benefit from economies possible under unified operation.

CONVENTION SCHEDULE

Iowa Independent Telephone Association, Fort Des Moines Hotel, Des Moines, Feb. 24, 25 and 26.

Oklahoma Utilities Association, Tulsa, New Hotel, March 8 and 9.

Texas Independent Telephone Association, Texas Hotel, Fort Worth, March 22, 23 and 24.

South Dakota Telephone Association, Sioux Falls, April 6 and 7.

Ohio Independent Telephone Association, Deshler-Wallick Hotel, Columbus, April 12, 13 and 14.

Kansas Telephone Association, Jayhawk Hotel, Topeka, April 19, 20 and 21.

United States Independent Telephone Association, Southern District, Bristol, Tenn., May 4, 5 and 6.

Indiana Telephone Association, Claypool Hotel, Indianapolis, May 11 and 12.

The Northwestern Bell Telephone company plans to continue with a program of improvements at Rock Rapids, Ia., started last year. This program consists of the laying of a considerable portion of underground cable and the stringing of new wire.

Some Physical Characteristics of Speech and Music*

By DR. HARVEY FLETCHER
Accoustical Research Director, Bell Telephone Laboratories

Kinematic and statistical descriptions of the physical aspects of speech and music are given in this paper. As the speech or music proceeds, the kinematic description consists in giving the principal melodic stream, namely, the pitch variation and also the intensity and the quality variations. For speech and song, the quality changes are principally described by giving, besides the main melodic stream, two secondary melodic streams corresponding, respectively, to the resonant pitches of the throat and mouth cavities. To this must also be added the positions of the stops and the high pitched component of the fricative consonant sounds as functions of the time. The statistical description consists in giving the average, the peak, and the probable variations of the power involved as the various kinds of speech and music proceed. These general ideas are illustrated by numerous experimental data taken by various instrumental devices which have been evolved by the Laboratories during the past fifteen years.

A speech or musical sound is transmitted from the mouth of a speaker or from a musical instrument through the air to the ear of the listener by means of a pressure wave, a succession of condensations and rarefactions of the air. Such a wave spreads in all directions away from the source of sound and soon encounters solid objects which cause reflections. These reflected waves combine with the original one and thus modify the pressure changes taking place at any point. In this paper we shall be concerned chiefly with the pressure changes which take place before reflections occur.

Speech is composed of fundamental sounds called vowels and consonants. As a conversation proceeds there is a constant shifting from one of these sounds to another, only one of them being sounded at one time. Most of these sounds may be continued as a steady tone and hence may be designated as continuants. The others require that the sound stream be interrupted and are therefore called stops. The first class includes the long and short vowels, the diphthongs, the semi-vowels, and the fricative consonants, the sounds ā, ĭ, ou, l and s being typical, respectively, of each of these groups. The pure stops are p, t, ch, and k. In producing the corresponding voiced stops, b, d, j and g, the voiced stream is not entirely interrupted, although the tones from the vocal cord are very much subdued. A conversation, then, consists of a succession of continuants and stops and a physical interpretation of speech consists, therefore, of a description of these continuants and a discussion of the manner of joining the continuants together either directly or by means of stops.

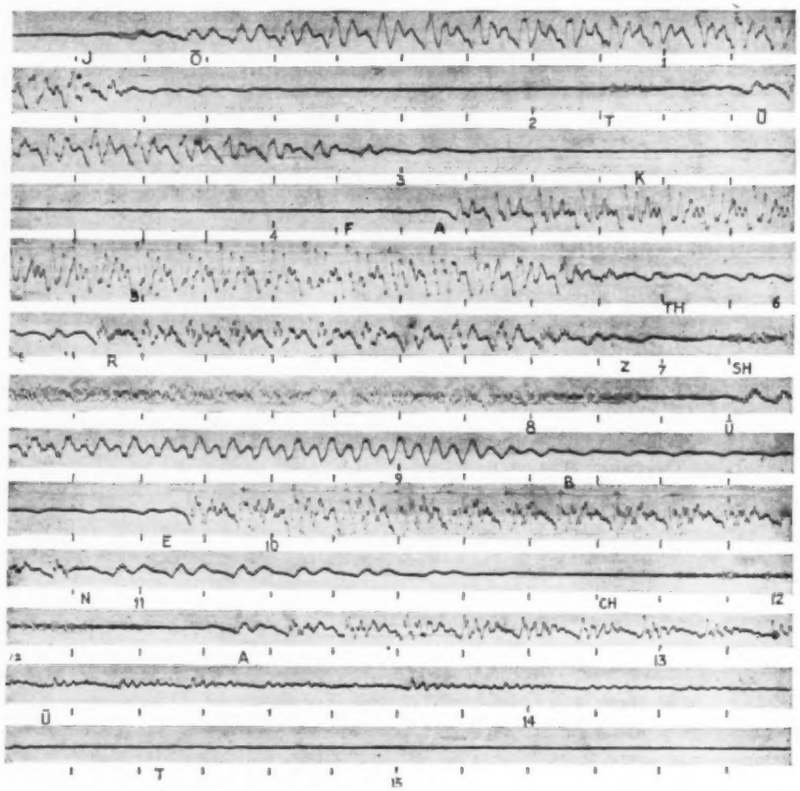


Fig. 1—Oscillogram: "Joe took Father's shoe bench out"—spoken.

Melodic Streams of Speech

As an example of how this analysis of speech may be made consider the sentence, "Joe took father's shoe bench out," an oscillogram of which is shown in Fig. 1.[1] This silly sentence was chosen because it is used in our laboratory for making tests on the efficiency of telephone transmitters. The sentence together with its mate "She was waiting at my lawn" contains all of the fundamental sounds in the English language that contribute toward the loudness of speech. In Fig. 1 the ordinates are proportional to the pressure change in bars and the abscissas are time intervals of .01 second. The eighteen fundamental sounds in this sentence are joined together without the stream of sound being interrupted except for the stops t, k and ch. The stop consonant b is voiced so that although the vocal cord sound is interrupted by the closing of the lips, it continues to sound in a subdued way until the stop is removed and the e sound begins. Pauses, that is, silent intervals, are made between sentences and sometimes between words. It will be noticed that a brief pause was inserted at the intervals .17 to .21 and .32 to .335 and .34 to .41 and 1.16 to 1.18 seconds. There is no such pause between "shoe" and "bench."

Speech, then, consists of a series of comparatively steady states of vibration joined together in time, either by silences or transitions from one steady state to another. Each one of these steady states is characterized by a pitch and a tone quality, and the sequence is essentially a melody. The melody of the sentence whose wave form is shown in Fig. 1 may

*Presented as invited paper in Symposium on Acoustics, American Phys. Soc., Dec. 30–31, 1930, Cleveland Ohio. Published in Rev. of Modern Physics, April, 1931, and in The Bell System Technical Journal, July, 1931. Reprinted in Telephone Engineer by permission from the Bell System Technical Journal.

[1]This oscillogram and the others following it were taken with the new high quality and high speed oscillograph which has recently been developed in our laboratory. It has an approximately uniform response for amplitude and phase from 20 to 10,000 cycles per second.

be illustrated graphically as indicated in Fig. 2. In this figure the ordinates represent the pitch in octaves below or above a tone having a frequency of one kilocycle per second; or if the frequency f is measured in kilocycles, then the pitch P is given by the equation

$$P = \log_2 f. \qquad (1)$$

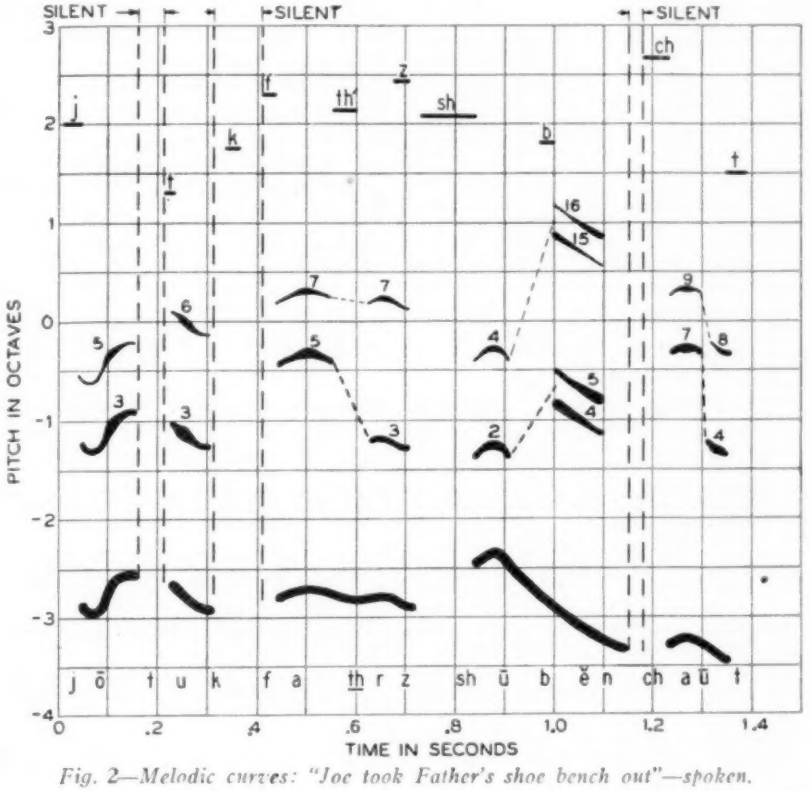


Fig. 2—Melodic curves: "Joe took Father's shoe bench out"—spoken.

The abscissas represent the time in seconds. The lower curve gives the changes in the pitch of the fundamental and represents the melody as ordinarily understood in music. The middle two curves represent the pitch positions of the strongest harmonics. The location of these positions is determined by the resonant properties of the throat and mouth cavities. These curves may be considered as secondary melodic streams. The combination of these two secondary melodic streams is interpreted by the senses as a sequence of spoken vowels rather than as a series of pitch changes. The small number above each part of the curve gives the number of the harmonic which is augmented by the resonance of the mouth or throat. For the sound e in bench the 4th harmonic was the strongest at the beginning of the sound, but the 5th came in strongest near its end. I have tried to indicate the relative intensities of the harmonics as the sound proceeds by the relative thicknesses of the lines. An examination of the oscillogram shows that the intensity of the harmonic always increases as its pitch becomes nearer the characteristic pitch for the vowel being spoken.

As indicated by the short lines at the top of the chart, there exists at certain intervals high pitched components which are characteristic of the fricative sounds. The unvoiced sounds t, k, f, z and sh, exist only when the three melodic streams are stopped. The high pitched components of the voiced sounds, j, *th* and b, are superimposed upon the three melodic streams.

Besides these four important streams of speech (Fig. 2), there are a great many others with intensities which are in general much lower, but when combined with the main streams they determine the kind of voice, that is, whether it is smooth and musical or rough and harsh. The main melodic stream for a woman's voice is between the pitches —1 and —2 octaves while for a man's voice it is between —3 and —2 octaves. The secondary melodic streams produced while speaking the same sentence are approximately the same for man and woman and of pitches shown in Fig. 2.

In Fig. 3 is shown an oscillograph of the sentence "How are you?" This sentence contains no stops. The sound stream is not interrupted; it is just a continuous variation from one vowel to another. In Fig. 4 the main melodic stream is given.

In Fig. 5 an oscillograph of the sentence "Joe took father's shoe bench out" is shown when the vowels of this sentence are intoned on the simple melody do-re-me-fa-me-re-do, and in Fig. 6 the melodic streams are given. In this case only the characteristic resonant pitch positions for the two secondary melodic streams are given. The chief difference between this figure and that for the spoken sentence is in the main melodic stream. For purposes of comparison the curves of the spoken and sung sentence are enlarged and shown together in Fig. 7. In the case of the sung sentence the pitch changes are in definite intervals on the musical scale while for the spoken sentence the pitch varies irregularly, depending upon the emphasis given. The pitch of the fricative and stop consonants is ignored in the musical score, and since these consonants form no part of the music they are generally slid over, making it difficult for a listener to understand the meaning of the words. Some of my friends in the musical profession object to this statement of the situation but I think you will agree that a singer's principal aim is to produce beautiful vowel quality and to manipulate the melodic stream so as to produce emotional effects. To do this, it is necessary in singing to lengthen the vowels and to shorten and give less emphasis to the stop and fricative consonants. It is for this reason that it is more difficult to understand song than speech.

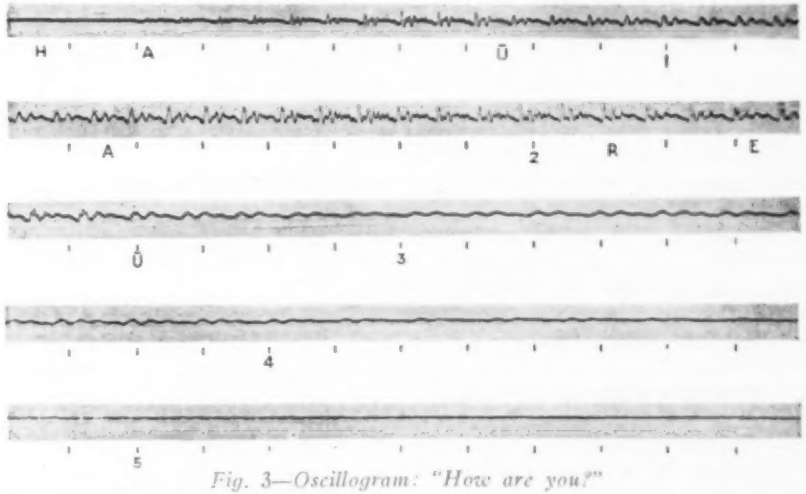


Fig. 3—Oscillogram: "How are you?"

Characteristic Pitch or Frequency Levels for the Vowels

Now let us examine part of the speech wave of Fig. 1 in more detail. Consider the vowel in the word "shoe."

The fundamental cycle was repeated 170 times per second. It is evident that the second harmonic is very much magnified until it is nearly as intense as the fundamental. In Fig. 8 is shown another

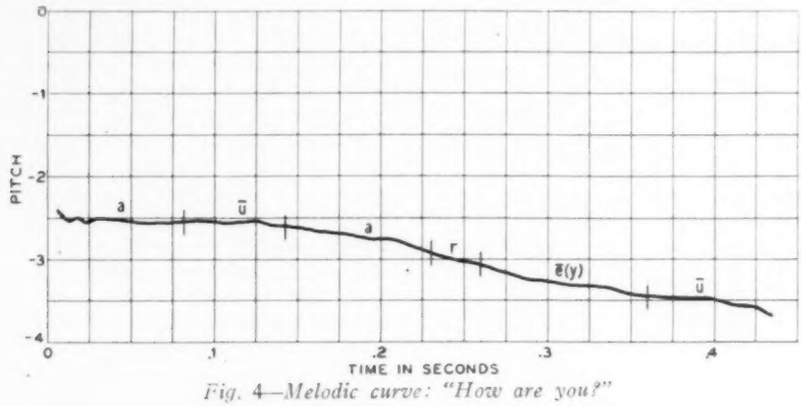


Fig. 4—Melodic curve: "How are you?"

oscillogram of ū intoned at 120 cycles per second. In this case the 3rd harmonic is magnified. An analysis of a number of ū sounds shows that components falling between 300 and 400 cycles per second are always reinforced. This reinforcement is probably due to the resonance characteristic of the mouth cavity.

Similar characteristic low pitch regions exist for the vowels in the words, put, tone, talk, ton and father. A characteristic *high* pitch region also exists for these sounds but the intensity of the components falling in it are much less. For the vowels in the words tap, ten, pert, tape, tip and team there are two characteristic regions of reinforcement which are of approximately the same intensity and which are independent of the fundamental pitch. This is illustrated in Fig. 9, which gives a spectrum analysis of the vowel "ē" pronounced at the four pitches indicated. The characteristic regions are at 375 cycles per second and 2400 cycles per second corresponding to pitches -1.4 octaves below and $+1.3$ octaves above the reference pitch.

Experimental work[2] has indicated that for American speech the characteristic pitch regions for the vowels and semivowels are those shown in Fig. 10. For the first six vowels the components corresponding to the characteristic region of high pitch are much less intense than those of low pitch. For the other vowels the intensities of both regions are about alike.

Oscillograms of the Unvoiced Continuants

Now let us examine more closely the wave forms for the fricative sounds, s, sh, f, th. They are shown in Fig. 11. These show only part of the oscillogram produced when each of these sounds was continued for about one second. It is seen that these sounds contain components having high pitches mostly above $+1$. It is seen that they do not have the wave form repeated as uniformly as was the case with the vowel sounds. They seem to be composed of a series of explosions. For example, the oscillogram for "sh" looks very much like one obtained from the sound of a skyrocket.

The f and th sounds are magnified six times in amplitude compared to the sh and s sounds. Although much fainter they still show this explosive character. There are 40, 45, 37 and 55 waves per each .01 second interval, respectively, for these four sounds corresponding to 4000, 4500, 3700, 5500 cycles per second.

[2] "Speech and Hearing," Harvey Fletcher, pp. 58, 59.

Acoustical Power of Speech Waves

Keeping this picture before us, as to the physical composition of speech, and its kinematic nature, let us now consider some statistical averages. If ten different persons spoke the sentence discussed above, there would be a considerable range of difference in the frequencies and intensities used to transmit it through the air. To get a typical cross-section of American speech, it would require at least 100 such sentences pronounced by at least 5 men and 5 women. This would involve the analysis of 18,000 fundamental sounds besides the transitions between them. Also, as was seen from the oscillograms given above, the wave form changes even where it is ideally supposed to be constant so that three or four sample waves from each steady state condition should be analyzed to find the components in each sound. Thus, we have the problem of recording and analyzing about 70,000 such waves. To analyze such a wave by the usual academic methods, namely, to plot the wave to a definite scale and then analyze it into its components by means of a Henrici or similar analyzer, would require at least two or three hours. So such a job for analyzing only the steady-state part of

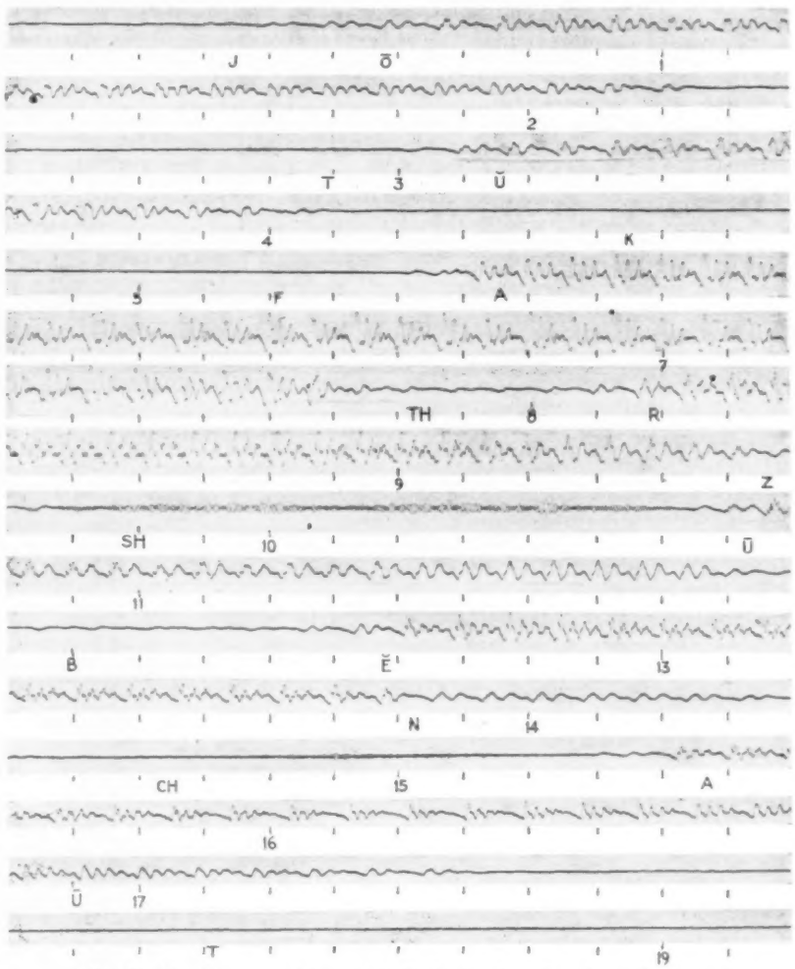


Fig. 5—Oscillogram: "Joe took Father's shoe bench out"—sung.

speech would require about 210,000 hours, or 100 years working seven hours a day for 300 days per year. In other words, such a method of attacking the problem is altogether too slow. To find the average intensities and frequencies involved in conversational speech, much more powerful methods for obtaining statistical averages were adopted.

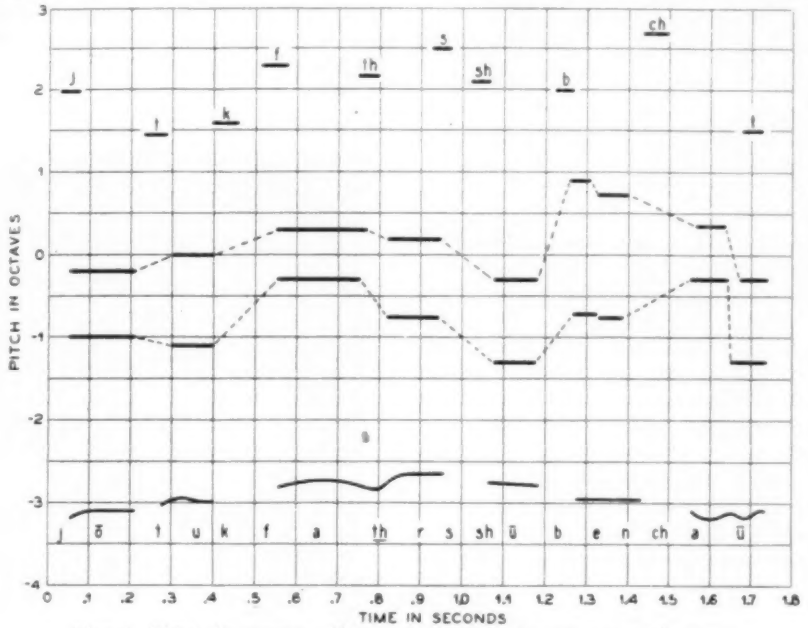


Fig. 6—"Melodic curves: "Joe took Father's shoe bench out"—sung.

There is a to and fro movement of the air particles simultaneously with the alteration of the air pressure. When the source is so far away that the disturbance can be considered as a plane wave, then the following relations exist between the pressure p, the displacement y, the velocity v, and the acceleration a of a layer of air particles, and the frequency vibration $\frac{\omega}{2\pi}$, namely,

$$y\omega^2 = v\omega = a, \qquad (2)$$

$$p = rv \qquad (3)$$

where r is the radiation resistance of the air and is given by the product of the air density by the velocity propagation of the wave. The intensity J of the sound at any point is the power passing through a square centimeter of the wave front and is given by

$$J = \frac{p^2}{r}. \qquad (4)$$

If J is expressed in microwatts and p in bars, this reduces to

$$J = \frac{p^2}{415}. \qquad (5)$$

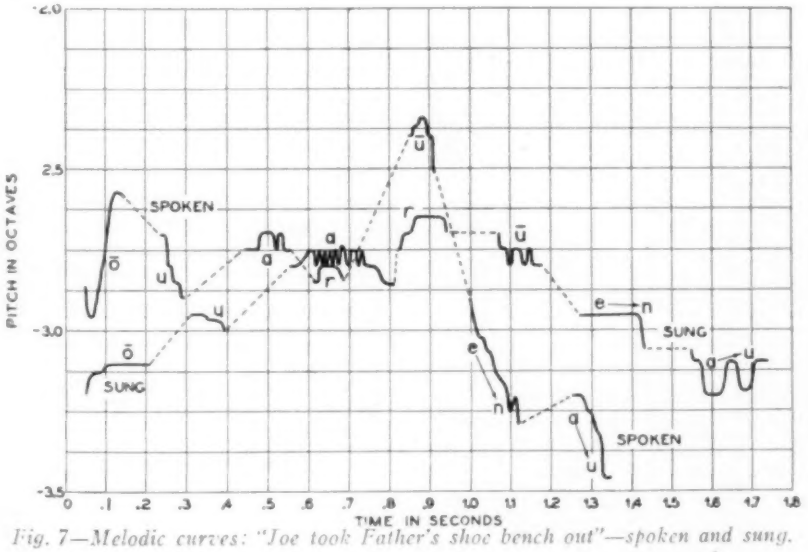


Fig. 7—Melodic curves: "Joe took Father's shoe bench out"—spoken and sung.

The intensity level I is defined by

$$I = \log_{10} J \qquad (6)$$

and is expressed in bels. These relations hold for any complex sound as well as for a pure tone if p is interpreted as the root mean square value of the pressure change.

It is seen then that all of these quantities can be determined by making experimental measurements of the pressure change. For accomplishing this the following methods were used.

The speech to be analyzed is picked up by a Wente condenser microphone and sent into a vacuum tube circuit. This circuit is arranged so that any one of 14 band pass filters can be inserted. After passing through the filter the electrical speech wave is then sent through a rectifier and finally into a meter. A schematic[3] of the circuit is shown in Fig. 12. Two kinds of meters are used. The first is a flux meter as shown in Fig. 12 for integrating the speech energy over any desired interval. When the rectifier is designed to give a value which is proportional to the average voltage, then the deflection of the needle of the flux meter will be proportional to the average pressure times the time. In other words, this device will read the average pressure during any desired time interval. In this way it is possible to find the average pressure in any one of the 14 bands. If the rectifier is adjusted so that the reading is proportional to the square of the impressed voltage then the reading will correspond to the average power. Knowing the calibration[4] of the transmitter and also its distance from the mouth of the speaker, it is possible to calculate approximately the average speech power.

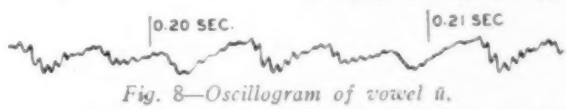


Fig. 8—Oscillogram of vowel ū.

The other type of meter shown in Fig. 13 consists of a series of parallel circuits, each containing an argon filled three-electrode tube connected in such a way that in adjacent circuits the tube breaks down and allows the passage of current for voltage levels which are 6 db (decibels) apart. Ten such circuits then cover a range of 54 db. In each of these circuits a relay and counter are connected so that for each tube discharge the counter operates. In this way the number of times the tube breaks down is automatically registered. The speech wave coming from the rectifier is sent into this meter where the peak values are measured; that is, the number of times the pressure exceeds a value fixed by each of these circuits will be registered automatically by the corresponding counter. The apparatus is arranged so that each other 8th second interval is measured, the intervening interval being re-

[3] See paper entitled, "A New Analyzer of Speech and Music," by H. K. Dunn (Bell Laboratories Record, November, 1930), and also paper entitled "Absolute Amplitudes and Spectra of Certain Musical Instruments and Orchestras," by Sivian, Dunn & White, Jour. Acous. Soc. of America, Jan., 1931.

quired for resetting the apparatus. In Fig. 14 an observer is shown reading the message registers after a test has been taken. The breakdown tubes are seen at the left and the filters at the right mounted on relay racks.

It is thus seen that with this apparatus 1000 observations may be recorded on a four-minute conversation, the final results being read directly from the series of counters.

By the use of this and similar apparatus the following results have been obtained: The average conversational speech power is 10 microwatts or 100 ergs per second. About one-third of the time no sound is flowing due to the pauses and the stops to form consonants so that the average conversational speech power is about 50 per cent higher than this value if the silent intervals are excluded. Some of the speakers will use a greater and some a lesser speech power than this average. In Table I are shown the results with a large number of speakers. It will be seen that about 7 per cent of the speakers will use in conversation average powers less than 1/16 the average while about 4 per cent will use powers which are from 4 to 8 times as much as the average. This value of 10 microwatts per second is of course for average conversational intensity. When one shouts as loudly as possible, this average speech power is raised about 100 fold and when one whispers about as softly as possible and still produces intelligible speech, it is reduced to about 1/10,000.

Table I

RELATIVE SPEECH POWERS USED BY INDIVIDUALS IN CONVERSATION

Region of average speech power	below 1/16	1/16 to 1/8	1/8 to 1/4	1/4 to 1/2	1/2 to 1	1 to 2	2 to 4	4 to 8	above 8
Per cent of speakers	7	9	14	18	22	17	9	4	0

(Keep this issue on file until next month, when the second and last installment of the above article will appear, so that you will not lose the continuity of the story.)

YEAR OF DEVELOPMENT FOR ATHENS TELEPHONE CO.

The Athens Home Telephone company, Athens, Ohio, believes in continued construction and preparation for the days of better business, and has backed up its beliefs by making the year 1931 a year of development. Without reducing wages an active program of expansion and maintenance was carried on and the community service substantially benefited.

New underground work was put in during last fall on eight Athens streets, thus proving the company's faith in the business future of its city and country by the expenditure of more cash in improvements in 1931 than in any year previously.

COURNEEN BECOMES SUPPLY MANAGER

F. J. Courneen, formerly of the purchasing department of the Stromberg-Carlson Telephone Manufacturing company, has been appointed supply manager, according to an announcement made by George A. Scoville, vice-president and sales manager.

Mr. Courneen, who has been associated with Stromberg-Carlson since 1917, will devote all his time in serving telephone operating companies in regard to construction materials.

Use of the five-day week plan and rotating of employment has enabled the Southwestern Bell Telephone company to keep most of its employes, in spite of the loss of 50,000 telephone subscribers in five states, according to A. B. Elias of St. Louis, Southwestern Bell president.

TRI-COUNTY TELEPHONE ASSOCIATION MEETS

The Tri-County Telephone Association of Eastern Pennsylvania held its annual meeting January 22, 1932, at Denver, Pa. Those companies represented included: The Denver and Ephrata Telephone and Telegraph company, Columbia Telephone company, Enterprise Telephone company, Conestoga Telephone and Telegraph company, Bethel-Mt. Aetna Telephone and Telegraph company, Mountain Telephone company, Schaefferstown Rural Telephone company, Manheim Telephone company, and Carbon Telephone company.

C. E. Eaby, manager of the Denver and Ephrata Telephone and Telegraph company and the secretary, John Martin of the Enterprise Telephone company, presided at the meeting. The following officers and directors were elected for 1932: S. H. Mountz, Landsford, Pa., president; Harry R. Miller, Myerstown, Pa., vice president; John K. Stoltzfus, Birdsboro, Pa., C. E. Eaby, Ephrata, Pa., and H. A. Oberdorf, Columbia, Pa., directors.

Talks on telephone sales were given by C. L. Fenton, district manager, Bell Telephone company, Harrisburg, Pa., Arthur L. Croft, manager, United Telephone company, Carlisle, Pa., and moving pictures on sales of 1931 were shown by L. R. Thurston, traffic superintendent of the United Telephone company, Harrisburg, Pa.

TELEPHONE PIONEER REGAINS HEALTH

The numberless friends of Roy Arter who have missed him from the telephone industry for nearly two years will be glad to know that he has recovered his health and has resumed his active work as chief engineer for the North Electric Manufacturing company. His slow loss of health was found to be due to a goiter which at last has been cured by a series of operations and treatments. Through this period he did not entirely give up his activities with the North company and was able to continue the management of the Summit Telephone company of which he is the principal owner.

Roy Arter, chief engineer of the North Electric Mfg. Co.

Mr. Arter has been active in the affairs of the North company for nearly 20 years. He has done important work in the development of the North company's "Auto-Manual" system for cities, the "Remote-controlled Satellite," and the "All-Relay" exchanges. He took a principal part in the joint work of the North and Westinghouse companies in developing the remote Power Control system which the North makes for the Westinghouse company and the latter company supplies with its power systems.

DOMMERQUE AND FENSHOLT BACK SOON

The regular installments of two series of articles, "A Development Study of the Toll Center District," by F. L. Dommerque, Fellow A. I. E. E.; and the "Elementary Course in Telephone Practice," by O. B. Fensholt, have of necessity been omitted this month. However, we hope to resume the articles in each series in the March issue.

Barnhart Pleads for Rural Subscribers

Below Is the Statement Relative to the Proposed Tax on Telephone and Telegraph Messages Submitted to the Ways and Means Committee of the House of Representatives by Henry A. Barnhart at a Hearing January 25 at Which Mr. Barnhart as Vice-President and F. B. MacKinnon as President Represented the United States Independent Telephone Association

I appear before you as a representative of the smaller and most widespread interests of the telephone business. I am not a lawyer but an operator of a telephone plant in a city of less than five thousand (5,000) population with rural lines reaching from five (5) to ten (10) miles in all directions from the city, and with toll or long distance lines reaching all towns in the county, and adjacent thereto, and there connecting with the long lines of other companies. I am president and principal owner of my company, president of the Indiana State Telephone Association, composed of all the telephone interests in Indiana, vice president and director of the United States Independent Telephone Association and, as most of you know, was a member of congress for six terms during which I made a record of such importance that no one has ever given me a medal of honor nor have I ever heard a hint that any man or group of men contemplates a statue of bronze or marble to perpetuate my memory. And if I were to tell you how my present salary compares with the $7,500 I drew as a member of congress I can imagine I could hear you exclaiming in concert: "How careers do skid"!

So much for introduction.

I said I represent the smaller or lower bracket telephone interests and to that branch of the business I shall largely confine my observations.

Twenty-five to thirty years ago the necessity of telephone service in the smaller towns and rural communities had its big inception. Then there was but one country-wide telephone building organization in the United States and it had had enough experience to know what good telephone service cost and the people of the smaller communities refused to pay the price such good and enduring service necessitated. So some doctor, or merchant, or group of farmers would organize a company and build a telephone plant; using material and methods of construction in harmony with the cheap rates for service the public was agreeable to paying. Inexperienced managers were in charge, the business was usually run on a cost or an all-paid-in all-paid-out basis, and when the apparatus wore out, as it always does in twenty or thirty years at the most, there was no depreciation reserve provided for rebuilding, and one of two things happened—either the plants were sold to corporations that had to raise rates to make operation and interest expenses, or else the properties were permitted to run into virtual obsolescence. And in either event, service efficiency has degenerated into such an unsatisfactory condition, patronage is quitting and revenues falling. This is a fair picture of the condition of the small or mutual telephone systems of the country. My own state of Indiana has nearly five hundred community and small town exchanges and I think I am safe in saying that not more than ten per cent of these are paying any profit at all and the others are surely drifting into eventual bankruptcy or abandonment if present adverse financial conditions on the farms, and in the homes of town people of ordinary means, continue.

And now comes the Government with a proposition to levy a heavy tax on long distance telephone messages, principally on communications between rural communities or towns and cities. And not satisfied with this suggestion of a tax on communications they have set up a schedule of charges wherein the farmer and small town citizen would pay thirty-three and one-third per cent increase on the fifteen cent message he mostly uses for nearby farm, family, social and local business purposes, while the business man user of one dollar message service would pay less than ten per cent and the user of a five dollar message would pay only two per cent increase.

It looks to me, Mr. Chairman, that this proposition was formulated purely as a means of tax getting without any study of fairness in its application or disastrous results in its consequences.

Why, sirs! A mere suggestion of need of increase in telephone rates is now a signal for the heavy withdrawal of patronage and that means a shrinkage of income revenues which I believe, as surely as I stand in your presence, will amount to more than the proposed message tax to say nothing of the cessation of the flow of telephone communications, so necessary to business activity.

And not only this, many telephone patrons such as shut-ins and elderly people who use their telephone mostly to talk to friends or relatives in other nearby communities, will discontinue their telephone service if they feel the message fee has been increased to meet so-called Government extravagance; and the shrinkage of station patronage as a consequence, added to that already in full swing due to the business depression that besets us, will be a blow to telephone companies which many of the smaller ones will not be able to survive.

Anyhow, why single out the communications business—telephone and telegraph—for a withering tax and all other utility activities go free? Taxing this admitted means of help to business livelihood and revival seems to me not only unfair but fallaciously deterrent. We are willing to pay increased income tax to meet the needs of our Government's economic administration, but if you tax our patronage away from us, as the proposed message tax will do, you unquestionably deprive us of the means of paying our share of the income tax that you are fixing on all other utilities and corporations, and that we *could* pay if our patronage were not alienated by what many will consider a prohibitive message tax.

In conclusion, may I submit for your serious consideration, declarations by the two big farm organizations of our country, as follows:

This is an appeal of the National Grange, in 1924, for abolition of the then telephone message tax:

RESOLUTION

"Whereas, during the war a business tax of 5c was placed upon every telephone message from 15c to 50c; and

"Whereas, this tax rests heavily upon the small telephone user and especially upon the farmer or rural dweller who lives just outside a city or village; and

"Whereas, this tax is excessive, being 10 per cent to 33 1-3 per cent of the business; be it

"Resolved, that this body ask the next Congress to repeal this tax law."

"We note that the House of Representatives in passing a general revenue bill, included the repeal of this tax on telephone toll charges, but that the Senate Finance committee has restored the tax.

"We would respectfully urge that at least the 5c tax be removed, as it falls so heavily upon the rural dweller and small user. The reasons for removing the tax on admissions to entertainments below 50c would be more applicable to removing this high tax on small telephone

(*Continued on page* 31.)

Urge Constructive Action at Convention

Need for Advertising and Selling Campaigns Emphasized by President and Speakers at Twenty-third Meeting of Minnesota Telephone Association Held January 26-29 at Minneapolis. S. A. Rask Chosen President; J. C. Crowley, Jr., Secretary, and F. C. Marvin, Vice-President

The Minnesota Telephone Association held its 23rd annual convention at the Radisson Hotel, Minneapolis, January 26, 27, 28 and 29. The attendance was good and reports given by various managers showed that everyone was hopeful concerning the future.

The need for advertising and publicity programs, first acted upon seriously last year, was again emphasized at this state convention. The remarks of most of the speakers were directed toward reiteration of the wiseness of this policy.

President S. A. Rask of Blooming Prairie, opened the convention by delivering the report of Secretary J. C. Crowley which had been submitted to the board of directors.

In referring to legislation he quoted Mr. Crowley stating that "many bills were offered that would have affected the industry adversely if they had succeeded in passage. Your officers and many members of this association were in constant attendance.

"As a result of the splendid co-operation we received it is gratifying to report that no adverse legislation succeeded in passage."

Commission Handles Rate Cases

The commission, it was reported, handled 12 rate cases which were presented to it by the association. Nine indeterminate permits were granted, and 13 purchases, sales and transfers were approved.

President Rask brought out that because no district conferences were held during 1931, the secretary was instructed to lend his assistance to all companies in defense of their lawful rates and to prepare such data and publicity as was necessary to meet the situation.

In closing his remarks, President Rask declared that the companies must do more advertising in their communities. "If more advertising had been done in the past five years," he said, "there would not be so many requests for rate reductions now."

J. P. Mason, general commercial manager, Northwestern Bell Telephone company, Minneapolis, gave an interesting address on "Some Thoughts and Some Suggestions."

He briefly outlined the activities of his company during the year and its plans for 1932 in the way of improvements. He discussed the company's sales program and the lessons learned. He said:

"We are going ahead with projects which are sound and economical. They might be deferred but if done now will place us in a stronger position when business conditions improve, and will enable us to furnish work during this coming year for a maximum number of people. Our gross expenditures for improvements in Minnesota during 1932 will run to about the same as last year. About 18 per cent of this amount will be for toll and 82 per cent for exchange projects.

Mason Tells of Sales Efforts

"A year ago when we last met together in St. Paul, we all agreed that 1931 was going to be a sales year—and so it has been. I'd like to tell you briefly just how much of a sales year it was with us.

"During 1931 more than 11,000 telephones were sold in comparison to about 6,800 in 1930. Despite the sales activity we had a net loss of 3,800 telephones, so you can form your own conclusions as to what our net loss might have been had our sales efforts been less aggressive.

"Participation in sales work by all employes produced nearly 14,000 sales, 8,800 more than in 1930. So much for what we have done. We are not satisfied with this job particularly and hope to improve on it this year. I think we are all better organized to perform the necessary jobs confronting us. As far as our own plans go for 1932 we have set up a very definite sales program which calls for at least one interview with every subscriber to business service in Minnesota."

Discusses National Association

"The National Association and Conditions in Iowa" was the topic discussed by C. C. Deering, Des Moines, Iowa, secretary of the United States Independent Telephone Association.

"The telephone industry," said Mr. Deering, "has been having an unusual experience. Since its beginning it has shown a growth each year. At times its growth has slowed down. In 1930, it had a small growth and last year it showed a loss."

In the future, declared Mr. Deering, a telephone man's ability will be measured by his salesmanship, and more of the revenues of the telephone companies must be devoted to publicity and advertising. The business which has been lost during this period of recession will come back if the telephone people do their jobs as they should, he stated.

Discussing the affairs of the national association, the speaker mentioned the order of the Interstate Commerce Commission on depreciation which will become effective next January. He spoke of the legislation now pending before Congress, in which a revival of the tax on telephone tolls is under consideration, and said that the association officers have appeared before the Congressional committee to testify as to the effect on the industry of such a tax. He stated that taxes on short-haul or low rate toll calls are burdensome and should not be imposed on this class of calls.

An interesting transmission demonstration was presented by H. B. Nelson of the Northwestern Bell Telephone company, Minneapolis, who said, in prefacing his demonstration:

"The production of the telephone industry, of which we are all a part, is communication service. The wide range of uses to which this service can be applied, and the advantages to be gained by using it are rapidly becoming more completely realized by the people of this country. As a consequence the demands for telephone service are increasing at a rate truly remarkable."

Election of Officers

The election of directors results in the re-election of the entire board, which consists of: P. M. Ferguson, Mankato; Jay Greaves, Glencoe; A. H. Dreyer, Starbuck; G. M. Dwelle, Lake City; H. F. Lueders, Norwood; Hans Swanson, Warren; S. S. Rask, Blooming Prairie; Irving Todd, Hastings; E. L. Wright, Alexandria; F. C. Marvin, Zumbrota.

The board of directors elected the following officers: S. A. Rask, president; F. C. Marvin, vice-president; and J. C. Crowley, Jr., secretary-treasurer.

PROGRESS OF TELEPHONE SHOWN IN OLD BOOK

Directions given in an old telephone book dated 1909, show how far the telephone industry has progressed in the last twenty-three years.

Here are some of the important notices to subscribers contained in a book of that year unearthed by R. R. Shives of the Southwest Telephone company, Liberal, Kans.:

"Ring off when through talking." "Do not use the telephone or call central during thunder storms." "Office hours are from 5 a. m. to 11 p. m. Do not call after 11 p. m. unless for urgent business."

News From the Field

The Southern New England Telephone company plans to spend $8,000,000 for construction and improvements during 1932.

New switchboard equipment adequate to care for 800 additional telephones making a total of approximately 4,850 telephones, has been installed in Belleville, N. J., by the New Jersey Bell Telephone company.

Farmers of Bureau county, Ill., are considering plans for a mutual telephone company at Sheffield, Ill.

The Northwestern Bell Telephone company is planning improvements in South Dakota estimated to require a gross expenditure of $1,912,000 during 1932. The construction program includes material and work on both local and long distance lines, central office equipment, the purchase of land, erection of buildings, etc.

Extension of the Bluffton, O., central service to include all subscribers now in the Rockport, O., exchange, has been announced by officials of the Bluffton Home Telephone company. The work necessary preparatory to taking over the exchange has been estimated to cost $4,800.

Dunn Center, N. D., which because of various difficulties almost lost its telephone exchange, will continue to have telephone service according to a late report which indicated that civic interests have prevailed upon the owner of the exchange to continue the service.

A modern telephone system is being installed in Ida Grove, Ia., by the Western Telephone company. A new office is being built and the whole town is to be rewired.

The Hahne & Company department store in Newark, N. J., has installed a new telephone service for the benefit of persons residing in New Jersey towns near to Newark. By arrangement with the telephone company, it is possible for customers in these towns to pick up their own telephones, ask for the number of the Hahne store, and be promptly connected, although the toll charges are paid for by the store.

The Mountain States Telephone and Telegraph company will construct a new exchange at Gillette, Wyo., to cost approximately $5,200.

The Kansas Telephone company has completed installation of $17,000 worth of equipment at the exchange at Whitewater, Kans.

The Wisconsin Telephone company plans to spend $118,000 for replacements and betterments at Racine, Wis., during 1932.

The United Telephone company recently made repairs and improvements to the lines and property of the exchange at Norcatur, Kans.

Officers of the Preston Telephone company, Preston, Ia., at its annual meeting recently, announced a $2 stock dividend, which is a little over six per cent.

Two projects to be constructed at a cost of $93,000 have been begun by the Northwestern Bell Telephone company in North Dakota. Construction of a new telephone cable between Bismarck and Mandan is under way, to cost $52,000, while line reinforcement and repair work has been started on a section of the Fargo-Bismarck long distance telephone line to cost $41,000.

Work will be started shortly in Eau Claire, Wis., by the Wisconsin Telephone company, connecting telephone cables terminating in the present central office building, to the new building located one block distant. An expenditure of $22,000 is involved.

Telephone poles on the down town streets of Garnett, Kans., are being eliminated and the cables placed underground, by the Southwestern Bell Telephone company.

Telephone service has been completely restored to 1,400 subscribers at Willoughby, O., following a fire which damaged the exchange's cable room. The cost of repairs was estimated at $50,000.

All trains of the New York, New Haven, and Hartford Railroad company are dispatched by telephone. It is possible for any point on the railroad, by means of long distance circuits all along the line to communicate directly with any other point. In the New Haven telephone system are more than 19,600 miles of wire; more than 4,400 telephones. The value of its telephone plant, owned exclusively, is approximately $3,000,000.

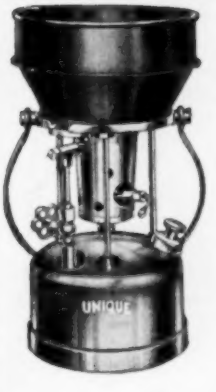
At the close of 1931 each telephone reached by the Wisconsin Telephone company had been used 1,056 times, according to a recent estimate made by William R. McGovern, president of the company.

The reduction in rates promised for Minneapolis and St. Paul by the Northwestern Bell Telephone company will be put in effect in both cities as soon as the interstate commerce commission announces its final approval of the Northwestern company's purchase of the St. Paul business and properties of the Tri-State Telephone and Telegraph company, according to an announcement by Frank Bracelin, general manager of the Northwestern Bell in Minneapolis.

The expenditure of $10,513,265 for new construction throughout the state was authorized by the board of directors of the New York Telephone company at the regular monthly meeting held December 23, according to an announcement made by J. S. McCulloh, president. This brings the total appropriations during 1931 to $69,116,545, of which $53,250,145 has been provided for the extension of facilities in the metropolitan area of New York.

The Boston and Maine railroad has the largest dial telephone switchboard of any public utility in New England, in Thompsonville, Conn. It has a capacity of about 17,000 calls a day.

The Mellott Telephone company, Mellott, Ind., has filed notice of preliminary dissolution.



TEN MINUTES

to melt 50 pounds of solder! Couple this feature to the strength and simple design of all UNIQUES — and you have the reason it's preferred in the telephone field. We'll send it on trial. Write—

UNIQUE
Manufacturing Co.
225 Whiting St.
Chicago, Illinois

Blasting the Hole to Set the Pole

A Brief Description of a Method Commonly Employed by Construction Crews in the South. In Wet, Swampy Soils Dynamite Does Its Work with Neatness and Dispatch

By K. H. WILLIAMS, Plant Supervisor
Inter County Telephone and Telegraph Company, Fort Myers, Florida

Setting poles in muck or quicksand, especially if covered with water, has always been a problem. The old system of knocking both heads out of a barrel and sinking it, or sharpening the pole and rocking it down was slow and expensive. If an average-sized crew could set eighteen or twenty poles by this method, it was considered a good day's work.

Now the same crew, working with dynamite, can set as many as sixty-five poles a day!

Explosives have always been used to some extent for setting poles in hard clay or rock, but the effect of exploding dynamite under a pole appears to have been discovered accidentally.

A South American power company had occasion to pull a large tower pole. Workmen had applied a pulling force equal to sixty-five tons without moving it. The foreman decided that a charge of dynamite placed under the pole might loosen it up. Much to his surprise, when the shot was fired, the pole dropped into the ground five or six feet farther.

This incident was the starting point of a new technique of pole setting with dynamite, which has been improved on by the utility companies, largely in Florida, until it is used almost entirely wherever blasting can be done without damage to sewers or water mains. The proper method is as follows:

Regardless of how much water covers the site, it is always possible to dig a shallow hole which will serve as an anchor to the butt of the pole. Next, place a piece of two-inch pipe, six feet long, upright in the center of this hole. Then insert either a one and one-half-inch auger or an ordinary digging bar inside the pipe, and work it up and down with a churning motion. Sometimes a thin layer of rock or clay underground interferes, in which case a pre-charge of one-half stick of dynamite is used to break it. But usually the pipe will settle quickly.

How far down the charge should be placed depends on the soil formation and the weight of the pole; the heavier the pole, the easier it will go down.

When the proper depth is reached, remove the bar or auger. The dynamite charge, primed with an electric detonator, is then pushed down through the pipe and held there with the tamping stick until the pipe is pulled up. The stick is then removed.

Now, directly above the loaded charge, raise the pole, hold it in place with four pike-poles or ropes, and fire the charge.

Poles should be marked for proper depth, and with a little practice can be set to the half inch.

Care should be taken not to place the charge too far below the butt of the pole; otherwise a gas pocket may be formed with a stratum of earth between it and the pole. Should this happen, punching around the base of the pole with a digging bar will generally cause it to break through.

If the pole does not drop full depth after the first shot, load an extra half stick under it and shoot again.

During the past six years I have supervised the setting of approximately 1,000 miles of pole line by this method, without one serious accident.

AUTOMATIC TELETYPE COMMUNICATION AT ONTARIO

The Bell Telephone Company of Canada has announced the establishment of the teletype system of automatic typewriter communication throughout its territory, which includes the provinces of Ontario and Quebec.

The system connects with a similar service recently inaugurated in the United States, where teletype machines are installed on a straight toll charge basis, tolls to be based on five-minute units and which cost about the equivalent of a three-minute station-to-station long-distance telephone call.

In Ontario teletype exchanges or central offices will be opened in Toronto, Windsor, London and Hamilton, while smaller localities will be able to tie into the system through a direct connection with the nearest of these. The system, being international in scope, will facilitate rapid communication between all important commercial centers of the United States and Canada.

Telephone Activities in Foreign Countries

Dispatches from Abroad Keep Telephone Men in United States Constantly Informed Concerning Telephony of the World; Domestic Telephone Problems Oftentimes Can Be at Least Partially Solved by Watching the Outcome of Experiments Made Elsewhere

Long Distance Saves Time for Diplomats

Foreign diplomats were startled during recent negotiations with the United States concerning the Moratorium for war debts, to find the former channels for diplomatic correspondence, always clogged to sluggishness with numerous clerks, secretaries, bureaucrats and subordinates, overcome by the United States in a single stride, through the medium of the long-distance telephones.

The trans-Atlantic telephone circuit, which joins the United States to Europe by means of a combination of radio and wire circuits, fairly buzzed during the period of negotiations with important conferences between Department of State officials in Washington and representatives in Paris. President Hoover conversed at least twice daily, and sometimes three or four times, with Secretary of the Treasury Andrew Mellon in Paris.

Conversations lasted between five minutes and a half hour, the majority of the calls being filed by Secretary Mellon. Operators in Washington were informed at least a half hour beforehand, when it was known the Secretary of the Treasury was to call the President. This enabled Mr. Hoover to call Acting Secretary of the Treasury Ogden Mills and Acting Secretary of State William R. Castle, Jr., to his side before conversing with Paris.

State Department officials revealed that the use of the telephone circuit resulted in a tremendous saving of time. It marked the first time a typically American business practice of using the telephone has been applied to diplomacy. Much time was saved in conducting the negotiations, it was said, as when either the President or the Secretary found some criticism with the proposed discussion, they could discuss the question immediately, without having to flash several questioning cables across the Atlantic.

Secrecy in the telephone conversations was maintained by voice scrambling in transmitting the messages across the Atlantic, which is believed by cryptographers to be far more secretive than the most involved ciphers and codes.

Danish Posts and Telegraphs Show Surplus First Quarter

A statement recently released by the Department of Posts and Telegraphs shows that revenues during the first quarter of the current fiscal year totaled 15,308,156 crowns, compared with 15,246,052 crowns for the like quarter of the preceding year. (One crown equals about $0.27.) At the same time expenditures, including interest and amortization payments, came to 15,200,139 crowns for the 1931-32 quarter and 15,325,249 crowns for the corresponding quarter of last year. Thus during April-June of 1931 a surplus of 108,017 crowns has been recorded against a deficit of 79,197 crowns during the same period of 1930.

Telephone Progress in Guadalajara (Mexico)

Telephone service between Guadalajara and Sayula, Jalisco, was inaugurated recently by the Compania Telefonica Mexicana. Considerable interest was aroused in Guadalajara by the agreement between the I. T. T., the holding company for the Compania Telefonica Mexicana, and the Ericsson Telephone company, both of which are represented in this city. It is believed that the two services will eventually be merged which will give a much more complete service for this city and the surrounding territory. At the present time there is confusion and lack of proper facilities for inter-connection between subscribers of the two different companies.

Hungary Erecting Radio Station for Oversea Use

The transmitting station now under construction at Szekesfehervar, Hungary, with the receiving station located at Tarnok, Hungary, will primarily be a high-powered short-wave commercial radio telegraph station, the first one of this kind in Hungary, designed to maintain a regular direct wireless telegraph service with the United States and other countries overseas.

According to present plans, it will be ready for operation about the summer of 1932. The exact wave length, frequency, and call letters have not yet been determined. The transmitters now under installation will have a power of 20 KW each. The Hungarian Postal administration will be in charge of the station. This station, although primarily a radio telegraph station, will be used, when plans will be worked out, for exchange, on the short waves, of international broadcasting, and also for wireless telephony.

Inauguration of New Long Distance Service in Colombia

Recently the Cia, Telefonica Central, an affiliate of the Associated Telephone and Telegraph company, inaugurated long distance telephone service between Bogota and Buenaventura on the West Coast, serving 28 cities and towns, according to a report from Walter J. Donnelly, commercial attache at Bogota, Colombia. This toll line, 357 miles in length, provides Bogota with its only telephone circuit to the sea coast. The laying out and construction work took about two years.

Extension of Long Distance in Paraguay

It is reported that satisfactory progress is being made in the extension of the long distance telephone lines of the Paraguay Republic. Recently long distance conversation between Asuncion and Paraguari was inaugurated. It is hoped that by December the telephone system of Paraguay will be extended to the Argentine frontier at Encarnacion, and by that time a short extension will have been made to the Argentina long distance telephone system, with the result that Asuncion will be in telegraphic communication with Buenos Aires and the rest of the world.

Philippines Want Coordinated Communications

Fileman Perez, secretary of commerce and communication for the Philippines, recently recommended the coordination of electrical communications into one system in which the government, if it so desired, could participate or with which it could cooperate. The Governor General supports this recommendation, also believing that such a coordination of the telephone, telegraph and other electrical communications would be the best solution of the radio program.

It is the Governor General's belief that such an arrangement would promote technical development and permit comprehensive advance planning for the building of a well-rounded-out system.

Telephone News From the Southwest

Notes of Telephone and Utility Interests in the Central Southwest Which Previously Were Reported for Transmitter and Electrical Journal, a Regional Magazine of that District Which Has Been Absorbed by TELEPHONE ENGINEER, Appear in the Following Columns

Tidings From Texas

Complete Sales Campaign

The Rio Grande Valley Telephone company, of which J. C. Paxton is general manager with headquarters at McAllen, has completed a sales campaign for its sixteen exchanges, extending over a period of twelve weeks and ending December 31st. During that time 139 employes made 807 sales with a total annual revenue of $18,341.00.

Oil Helps Telephone Business

Oil development in the neighborhood of Arp, Texas, reached the point early in 1931 where it became necessary to install a switchboard to take care of the business. Up to May, the telephone business at Arp was handled over rural lines out of Troup, one of the exchanges of the Gulf States Telephone company. With an initial list of twenty-five subscribers, a total of forty-three was secured by the time the switchboard was installed and by the end of the year the number had reached one hundred and twenty with a gain of ten more during January, 1932.

Graves Changes Position

J. E. Graves, manager of the Texas Home Telephone company at Mt. Calm, resigned his position on January 1st, and has accepted employment with the Three States Telephone company at Buffalo and Donie. Mrs. Graves took over the management at Mt. Calm until permanent arrangements can be worked out.

Changes to Common Battery

The Rio Grande Valley Telephone company will convert the exchange at Edcouch to common battery during the month of February. The building has been remodeled and enlarged to accommodate the new equipment.

Rebuild Toll Line

The Gulf States Telephone company is re-building the toll line between Athens and Kerens, a distance of 23 miles. This line was originally built along the Cotton Belt railway and consisted of iron and copper circuits which are being replaced by all copper. The new line is being routed along Highway 31. Creosoted pine poles and standard 10-pin fir cross arms are being used in the new construction. It is expected that the remainder of this line between Kerens and Tyler, a distance of 20 miles, will likewise be re-routed and re-built as soon as the present work is completed.

Paxton Active in Charity

J. C. Paxton, general manager of the Rio Grande Valley Telephone company, is serving this year as chairman of the finance committee for the McAllen relief committee which handles charitable work in that locality. Mr. Paxton originally served as chairman of the relief committee and since his retirement from that position has served as finance chairman. The annual banquet of the Rio Grande Valley company was held at the Stonewall Jackson hotel in San Benito on January 29th. This is the annual get-together meeting of the employes and almost 200 were present.

Convention Plans Progress

President L. S. Gardner of the state association states that the program committee is at work and that it is expected that several prominent telephone men from out of the state will be secured for the convention which will be held in the Texas Hotel at Ft. Worth on March 22, 23 and 24. He announces that there will be a banquet and a dance and that the committee is on the trail of some very interesting features for the banquet.

Another Charity Worker

E. E. Mockbee, manager of the Brownsville exchange of the Rio Grande Valley Telephone company, is the proud father of a ten-pound boy that arrived at his home in January. In addition to his telephone work, Mr. Mockbee is a civic worker and at this time is chairman of the Brownsville relief committee. When the telephone company moved into its new building about six months ago, it had an unexpired lease on its old quarters and accordingly donated the use of the old building to the relief committee. Several thousands of dollars of food and clothing were assembled at relief headquarters and distributed through its agencies.

Burton is Optimistic

General Manager Oscar Burton of the Gulf States Telephone company reports that in his opinion we have reached the bottom and are on the upward trend. He says that there is an improved mental attitude on the part of the people in his section of the state and that if a substitute for money could be found, everything would be all right.

Funeral Services for Alliott

Funeral services for Charles A. Alliott, 54, until recently manager of the municipally owned light and water plants in San Augustine, were held at Mount Calm, Hill County, January 6. Mr. Alliott died January 5, following a long illness. Ill health forced his retirement three months ago.

Mr. Alliott had resided in San Augustine since 1920. Prior to 1920 he had resided in Hill and McLennan counties, where he was for many years manager of telephone properties. He is survived by his wife, three brothers and two sisters.

Observations From Oklahoma

Plan Utilities Convention

All divisions of the Oklahoma Utilities association are planning their programs for the 14th annual convention of the association to be held at Tulsa, Okla., March 8 and 9, with headquarters at the new Hotel Tulsa.

The program is planned for two days with a preliminary session on Monday night, March 7, at which a first aid and safety work contest and demonstration will be held in which teams representing leading utilities of the state will participate. A general session for all divisions will be held Tuesday morning

March 8. Joint sessions of all divisions, except the telephone, will be held Tuesday afternoon and all day Wednesday. The Telephone Division meeting will be held Tuesday afternoon and all day Wednesday.

Among features planned by the Telephone Division is a special session devoted to traffic, accounting, commercial and public relations matters. Miss Anne Barnes, Des Moines, Iowa, traveling chief operator, United States Independent Telephone association, is expected to be at the convention to have charge of the traffic sessions. Telephone Division meetings will be in charge of C. G. Gardner, Oklahoma City, chairman of the Telephone Division of the association.

At the general session of the convention Tuesday morning messages will be given by the following representatives of the national associations: J. F. Owens, Oklahoma City, president, National Electric Light association; Kurwin R. Boyes, New York, secretary, American Gas association; T. J. Strickler, Kansas City, chairman, Natural Gas department, A. G. A.; and C. C. Deering, secretary, United States Independent Telephone association, Des Moines, Iowa. A representative of the American Electric Railway association is also expected to be present. Mr. Owens will also speak at the association dinner, March 8, where he will discuss the general utility situation in the light of 1932 conditions.

Commissions Ask Prompt Reports

Blank forms for making annual reports of the telephone companies to the Oklahoma Corporation commission for 1931 have been sent to all companies. The corporation commission has asked for prompt filing of these reports showing correct cost of plant and accurate financial and statistical information covering the operation of exchange and toll property. Annual returns of taxable property of service corporations for assessment purposes are due to be made to the Oklahoma Tax commission on February 28, 1932. State and federal income tax assessments of individuals and corporations must be filed on or before March 15, 1932.

Depreciation Accounting Reports

All A, B and C telephone companies, that is those having an annual gross income of $50,000 or more, are required to file depreciation accounting reports with the Interstate Commerce commission through their own state commission by September 1, 1932.

The telephone depreciation accounting order becomes effective January 1, 1933. Companies coming within the order will be required, if that has not already been done, to distribute their plant and equipment accounts to the primary accounts required by the commission's order not later than January 1, 1933. The I. C. C. is to prescribe the complete annual percentage rates of depreciation, and in order to assist the commission in establishing this rate each operating company is to file with its own state commission on or before September 1, 1932, estimates of the percentage rates applicable to the ledger values of the respective primary accounts of property covered in the order. These estimates are to be accompanied by a sworn statement showing the method and formula used in computation, or explaining in detail how the percentage figures to be applied for the rate of depreciation, were arrived at. These figures, submitted to the Interstate Commerce commission by the Oklahoma Corporation commission are to be used by the Interstate Commerce commission to finally determine the composite rate of depreciation applicable to the whole telephone property.

Complaint Against Zoning System

The Oklahoma Corporation commission has been hearing a complaint filed by Clarence Tankersley of Shawnee, Okla., against the zoning system as applying to telephone rates in Shawnee. The complaint also was directed against the 25 cents per month charge for hand set telephones. Representatives of telephone companies at the hearing declared that if telephone companies were not permitted to make an extra charge for the hand sets a great loss would be sustained, especially by the smaller companies who would be asked to install this class of service equipment and would have to discard much of their present equipment. This would mean a great loss to many of the smaller companies it was pointed out by H. W. Hubenthal, Oklahoma City, telephone engineer, Oklahoma Utilities association, who represented the independent telephone companies at the hearing.

Attorneys for the Southwestern Bell Telephone company declared at the hearing that if their company was not permitted to charge higher rates in zones farther removed from the central exchange it would be required to apply for increased rates.

Representatives of the telephone companies asked for a general hearing on the Shawnee complaint on the grounds that practically all telephone companies in the state would be affected by any order that would be made in connection with the Shawnee application. The request was granted and the commission set the general hearing for March 14.

Nims Well Known in Oklahoma

E. D. Nims, St. Louis, who recently announced his intention to retire as chairman of the board of the Southwestern Bell Telephone company, is well known in Oklahoma. Together with John Noble and E. E. Westervelt, he organized the Pioneer Telephone company at Perry, Okla., in 1896. It merged with other companies to form the Southwestern Bell Telephone company. Nims became president of the Southwestern Bell and resigned that position in 1930 after ten years. He was formerly a director and large stockholder in several banks in Oklahoma City. He was a pioneer in Oklahoma having made the run in 1893 into the Cherokee Strip.

BARNHART PLEADS FOR RURAL SUBSCRIBERS

(*Continued from page* 25.)

messages which are so vital to small rural business."

And this from James R. Moore, editor of the Hoosier Farmer, the state organ of the Indiana Farm Federation:

"Proposed tax on telephone messages in farming and suburban communities would create tax on the people who are already bearing unfair share of the burden. We must reduce—not increase the taxes of the rural people."

Finally, let me beseech you, gentlemen, not to tax instrumentalities for aiding sick business.

TELEPHONE WILL AID WORK ON LUSITANIA

Word comes from London, Englapd, that the Lake-Railey Lusitania expedition, organized with a view toward exploring that ill-fated ship, the Lusitania, believed to be resting on the floor of the Atlantic eight miles off the southwestern coast of Ireland, will start its actual explorations very soon.

An important part of the apparatus prepared for this dangerous undertaking, according to Captain H. H. Railey, leader of the expedition, will be a stout and intricate telephone system, especially designed for the rough, unique usage to which it is to be put. It will be installed in the Lake submarine salvage tube to guarantee swift, direct communication at all times with the divers when they are at work on the Lusitania, which is believed to be as much as 288 feet below the surface of the Atlantic.

The telephone system will be so designed than an observer at the base station on the trawler may carry on a conversation with the diver on the wreck. The latter's helmet will be fitted with a sort of loud speaker and a mouthpiece or transmitter. If two divers are out at the same time, one may talk to the other or listen in on the conversation between his mate and the observer in the operating chamber.

In all there will be eight stations.

THE TECHNICAL CLEARING HOUSE

B. C. BURDEN, Editor

Wiping Solder for Cable Work

Q.—What percentage of tin and lead should be used in wiping solder used in connection with cable work?

A.—Experienced cable splicers usually recommend that wiping solder consists of approximately 40% tin and 60% lead. If solder contains too small a percentage of tin a wiped joint is apt to be porous and may leak. The appearance of the wiped joint will indicate to the accomplished cable man whether the wiping solder is of the proper constituency. If the percentage of tin is too small the joint will have a coarse white appearance, and if the percentage of tin is too high the wiping solder will be difficult to handle and will have a glossy appearance when wiped.

Protection of Drop Wire Through Trees

Q.—How should drop wire be protect-

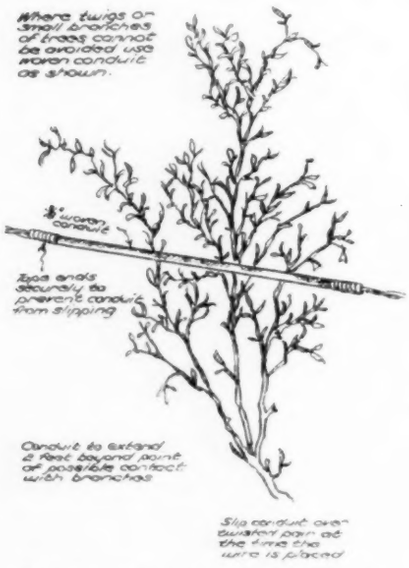

Where twigs or small branches of trees cannot be avoided use woven conduit as shown.
Woven conduit
Tape ends securely to prevent conduit from slipping
Conduit to extend at least beyond point of possible contact with branches
Slip conduit over twisted pair at the time the wire is placed

Fig. 1—Protection of paired wire through foliage

ed against abrasion where it passes through trees and is it impossible to keep the smaller limbs trimmed so that they will not rub against the drop?

A.—A method which is used by some of the larger companies and which gives very good results is shown in figure 1. With this method it is necessary to slip the woven conduit over the drop at the time it is placed. Another method sometimes employed which permits placing the protection on existing drops without the necessity of taking them down utilizes a two section wooden molding similar to that used to protect down guys. The molding is placed over the drop to be protected and the two halves securely fastened together by means of a wire lashing.

Bonding of Underground Cables

Q.—Should underground cables which pass through the same manholes be bonded together?

A.—Yes, it is always desirable to bond all underground cables together at each manhole. Ribbon bonds are usually used, although wire would serve just as well but would not present as neat an appearance. The purpose of such bonding is to insure that all cable sheaths between manholes are at the same potential thus preventing a cable of higher potential discharging to one of lower potential which might result in electrolytic damage to the cable sheath.

Joint Use of Rural Poles

Q.—Why is it that few of the large companies will consider joint use on the poles outside of the city limits, i. e., poles which feed the rural sections?

A.—One of the principal reasons that rural joint use is not feasible is because of inductive interference. Because of the length of the average rural lead as well as the voltage employed for power distribution, it would be quite difficult to keep induced noise down to a satisfactory value if power and telephone lines were both on the same pole line. The coupling between power and telephone line increases very rapidly as the spacing between them is reduced, and where the two classes of service are on the same pole line, small irregularities in vertical spacing bring about a much greater effect on the amount of induced noise and difficulty of transposition coordination than is the case where the lines are separated from 40 to 60 feet.

Other reasons that occur to the writer as being in favor of separate pole lines in rural districts is the greater possibility of physical contact between power and telephone lines if a single pole line were used. City pole lines are protected to a much larger degree than our rural lines from the full force of storms hence the greater hazard on rural construction. From the standpoint of economy of investment it is generally agreed that joint use on city plant is no more economical than separate pole lines, and if this be true then it is obvious that telephone companies could build rural pole lines cheaper individually than on a joint basis, inasmuch as clearance requirements generally permit the use of shorter poles on rural construction. Power companies however must continue to maintain sufficient height even in rural districts to insure against the public making physical contact with high voltage wires.

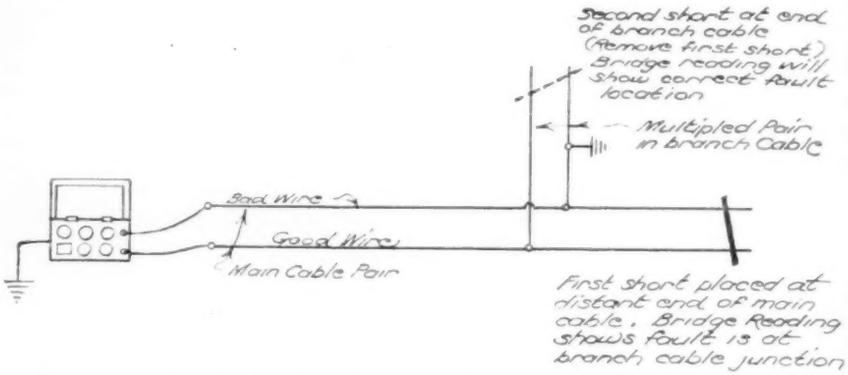

Second short at end of branch cable (Remove first short) Bridge reading will show correct fault location
Multipled Pair in Branch Cable
Bad Wire
Good Wire
Main Cable Pair
First short placed at distant end of main cable. Bridge Reading shows fault is at branch cable junction

Fig. 2—Location of cable faults on multipled cables

Location of Cable Faults

Q.—In making fault locations on aerial cable having multiple branch cables how can the fault be located if it happened to be in the branch cable and the good and bad wires used in arriving at a location by means of the Varley method were shorted at the distant end of the main cable as shown in figure 2?

A.—In a case such as you describe a Varley loop measurement would give a location indicating that the fault was at the point where the branch cable left the main cable. If the sheath at this point were examined (water trouble) and no opening found, then it could be assumed that the fault was in the branch cable.

The short should be then moved to the distant end of the good and bad wires in the branch cable and a new reading taken, which should show the correct location of the fault in the branch cable.

Transmitter Repair

Q.—What change takes place in a transmitter over a period of years which causes the volume output to decrease to such a degree that the transmitter has to be replaced with a new one?

A.—Assuming that a transmitter suffers no physical damage to diaphragm or to the mica window in the carbon cup, the reduction of volume output from a transmitter results from the carbon becoming burned and relatively insensitive. New carbon consists of highly polished particles of pure carbon and these particles are very sensitive in resistance characteristics to slight pressure changes due to the impinged voice on the diaphragm. Replacing the carbon in an old transmitter will often bring it back to normal transmission, providing the polished carbon electrodes are not pitted and in similar condition to the old carbon.

Cleaning and Polishing Receiver Shells and Transmitter Mouthpieces

Q.—Is there any way in which recovered receiver shells and transmitter mouthpieces can be cleaned and polished so as to remove the worn appearance they usually present after having been in service for some time?

A.—Receiver shells and transmitter mouthpieces of the bakelite or hard rubber type can be given a nice finish by the following procedure, but the composition type are not worth cleaning.

Procedure: Arrange a small motor (1,750 R.P.M.) so that a transmitter face and receiver shell holder may be attached to the shaft. The mouthpiece or shell to be cleaned and polished is then screwed into the holder and the motor used to revolve the object to be cleaned. Cleaning is accomplished by holding a rag saturated in any good cleaning solvent (such as Blue Ribbon) against the revolving shell or mouthpiece. Next wipe clean with a dry rag and then hold a small amount of No. 5-0 steel wool against revolving part to smooth the surface. Wipe clean of dust and apply small amount of ordinary liquid shoe dye to revolving part. Allow the dye to dry for a moment and then wipe thoroughly dry. This should be done before the dye is too dry, otherwise, rings of dye will form which cannot be polished off. Next apply a light film of ordinary black shoe paste with a dauber. Hold dry rag (felt) against revolving part until it is highly polished.

SCOTIA TELEPHONE COMPANY MAKES IMPROVEMENTS

The Scotia Telephone company, a Missouri corporation with headquarters in St. Louis, and operating other exchanges in that state, has begun the work of converting the telephone system at Union, Franklin county, Missouri, from the magneto type to the latest central energy type.

The new system does away with the use of the crank in calling central and also dry batteries at the sub-station, and provides lamp signals at the central office instead of drops. The obsolete four-party line will be replaced by a two-party selective ringing system, less complicated and more efficient.

The Scotia company has built in Union a handsome brick building, residence type, to be used exclusively for telephone service. According to P. Kerr Higgins, president and general manager of the Scotia company, the company expects to spend between $20,000 and $30,000 on the proposed improvements. The work will involve complete new equipment for every subscriber's telephone, for the central office, and new cables.

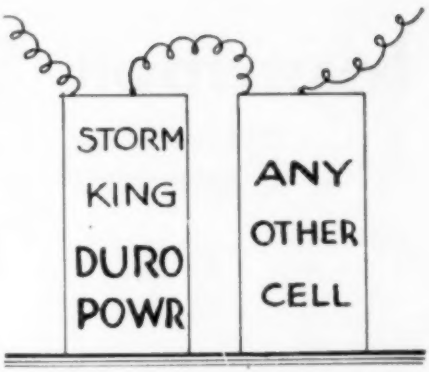
The Scotia company has also built a new pole line and strung a new aluminum metallic circuit between Linn Creek and Bagnell, a distance of twenty miles.

This is a new departure in long distance lines in Missouri and the new circuit is meeting the needs of the fast growing "Lake of the Ozarks" section recently opened by the construction of the Bagnell dam. The lake is 125 miles long and its 1,250 miles of shore line is beginning to be dotted with summer resorts. The new line takes the place of an iron grounded line and provides service for Camdenton, Linn Creek, Roach, Mack's Creek, Branch, etc.

The Central West Public Service company has added to its operation in Sac City, Ia., a shop for building and rebuilding telephones, switchboards, and other central office equipment. The principal reason for organizing and equipping this shop, according to E. B. Samp, district manager, was to offer employment and also to expedite the delivering of telephone equipment in the district and to more efficiently repair and maintain telephone apparatus.

E. L. Campbell has disposed of his interests in the Inland Telephone company, Bonner Springs, Kans. His two brothers, M. R. and Stewart Campbell, purchased their brother's holdings. E. L. Campbell was one of the original group who purchased exchanges in several Kansas towns which were later consolidated into the Inland Telephone company, with headquarters at Wellsville, Kans.

The telephone company at Allegan, Mich., plans to rebuild the line from Allegan to Ganges, using a complete metal circuit.



show down

STORM King Duro Powr Batteries are the only Telephone Dry Cells that are immune to crystallization — shelf deterioration — dry cell Cancer.

The seamless zinc cup has walls of uniform thickness*, without joints or solder. There is no place for crystallization or electro couples to start. The top is air-sealed against evaporation and contamination. Active life is assured for **years, not months.**

To prove it, hook up a Storm King in series with **any other cell.** Date both. On replacement, test each cell for volts and amperes. If Storm King does not show better readings, we will refund cost.

*Punching or stretching is unknown in the art of drawing. The micrometer will prove it. All zinc, whether soldered or drawn into dry battery cans, is *drawn* during the rolling of the metal from slabs to sheets or strips.

GENERAL DRY BATTERIES
INCORPORATED
CLEVELAND, O.

Makers of all types of dependable Dry Batteries for Radio, Ignition, Flashlight and General Use.

Masterbuilt Switchboard Solves Problem

Here Is a Story About the Scotia Telephone Company and How It Solved a Troublesome Problem for Future Growth at Festus, Missouri, for All Time

By E. R. SEARS, Representative
Kellogg Switchboard and Supply Company

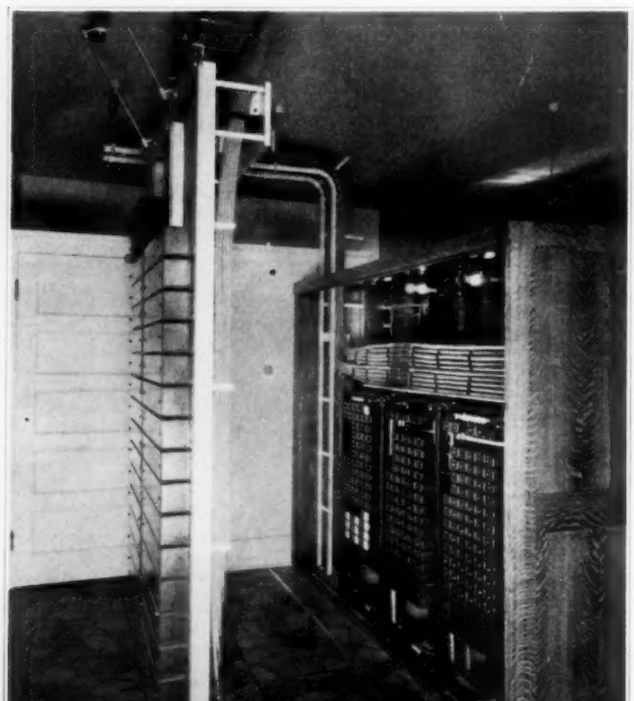
The new $30,000 telephone system of Festus and Crystal City, Mo., recently cut into service, is providing subscribers with the finest and most modern telephone service. The new Masterbuilt switchboard is the very latest in design and construction. It has many exclusive Kellogg features which permits speedy and accurate operation. Operators are able to handle a much larger volume of calls in a given time, than was ever before possible, while the service is equal to, or better than that found in the largest cities.

But to really understand this company's problem and its reasons for purchasing Masterbuilt equipment—it is necessary to know more of its early experiences. To go back to the beginning, it was in 1903 that the first telephone in Festus was installed at Ed Kerruish's general store. It was a toll station and connected with the De Soto exchange, fifteen miles south. During its first year of service, it proved to be very popular and so many calls were made, that the merchants of Festus realized the value of a more adequate exchange system and organized the Festus Telephone company. Soon after, a 50-line magneto wall switchboard was purchased and installed in the photograph gallery of Mrs. Minnie Andes. Ed Kerruish was appointed manager and acted in that capacity until 1921. In a comparatively short time, this exchange was serving fifty subscribers. Within a few years the company had grown so rapidly that the original switchboard was replaced with a two-position board.

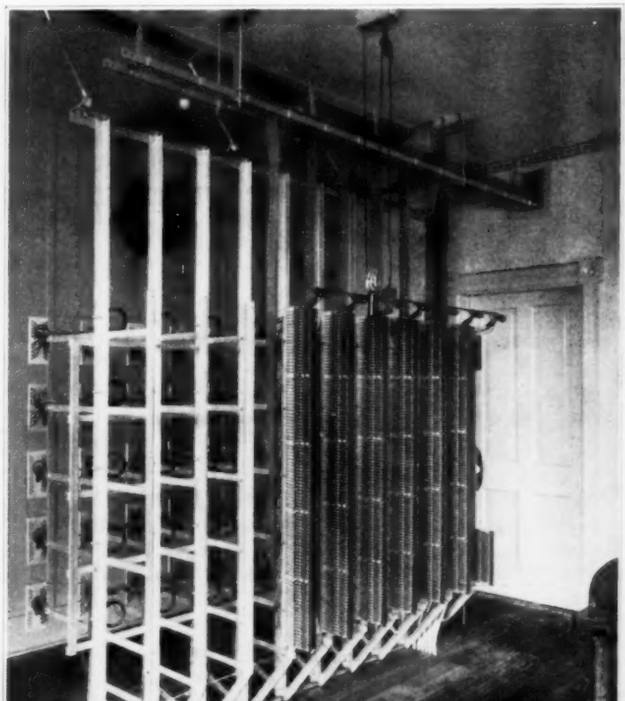
In August, 1921, the company was purchased by the Scotia Telephone company of St. Louis. Within five years, the Scotia company had increased the number of subscribers to the extent that it was necessary to replace the central office equipment again. After due consideration P. Kerr Higgins, president of the company, contracted with the Kellogg Switchboard and Supply company to furnish a three-position, 600 line magneto switchboard. This board served the subscribers of Festus and Crystal City until 1931. By this time it was filled to its capacity because of the constantly increasing number of subscribers, a list of which had grown from 320 to about 620 in a period of nine years.

Mr. Higgins, who has built up the company to its present success with the contention that the subscribers should be given every consideration and the finest service possible, decided it was time to install a modern, common battery switchboard. Again the Kellogg Switchboard and Supply company was called upon, and their engineers, co-operating with the company, made exhaustive studies at Festus to determine the exact type of equipment that would best meet the city's requirements.

It was found that due to the rapid growth of stations and the excellent possibilities of future growth, a switchboard would have to be installed that possessed great flexibility and the capacity to meet all future requirements quickly and economically. The traffic studies indicated that the company would require at the present, a toll and rural position and two local positions. However, at the time,

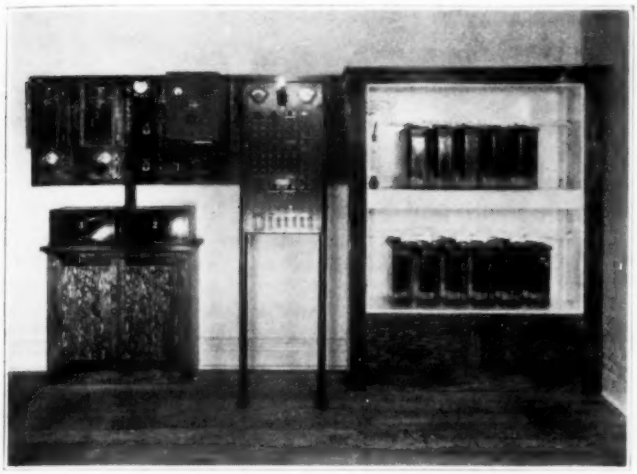


A rear view of the Masterbuilt switchboard and relay rack in the company's attractive new operating room



The new main distributing frame in the Festus exchange is an unusually neat, efficient bit of installation work

it was found that provision for future toll growth would have to be made. It would be necessary to provide an extra position for toll traffic as the toll board was to be in the local line-up, and eventually, two toll positions would be required. This, to save future expense and service interruptions would, of course, require a four-position switchboard. The disadvantage of this arrangement was the cost of extra equipment and non-earning blank positions that would lie idle until business was greatly increased.



The new power and ringing equipment at Festus. Notice duplicate installations to assure uninterrupted service in event of emergency

About this time the Kellogg company announced their new Masterbuilt switchboards. Here in an instant, was the answer to the whole problem—a problem that every company has to face when it installs a common battery switchboard—that of problematical future growth. Before the Masterbuilt idea was conceived, it was necessary in almost all cases to provide one or more positions which, while they might not be required at the time of installation, perhaps would be required in the future. This was specially true from a toll standpoint. This, of course, meant an additional investment for the company which would not prove useful for some time to come—possibly never! Conversely, if these positions were not provided and had to be put in at some future date, it meant that the switchboard would have to be rehabilitated almost in its entirety, a change that carried with it an exorbitant penalty in both money expended and service interrupted.

With a Masterbuilt board installed in the Festus exchanged, it would be necessary to have only enough equipment to handle the present traffic. Future requirements—which would be problematical—could be met at the precise time when the actual need arose. No idle equipment would have to be provided for future growth, as the local position of the Masterbuilt is convertible to a toll position evernight. A needless investment that had no earning power until a possible future growth materialized, was entirely unnecessary.

When the company officials learned of the Masterbuilt equipment they were quick to realize the value of its revolutionary principles. Consequently, Kellogg engineers were given complete charge of planning and installing the new equipment. New recommendations were made and a three-position Masterbuilt board with a toll and rural position and two feature local positions was installed. This installation alone represented an important saving in the original investment to the company.

The board has a capacity for 1600 local lines on a four panel multiple basis. There are 600 local lines equipped at the present time. The rural and toll lines terminate on drops and jacks with ten of each rural and toll lines equipped. Position No. 1 is used as a toll and rural position having space for calculagraph at the operator's right side. This position is equipped with ten Universal toll cord circuits. Positions No. 2 and No. 3 are used exclusively for local traffic and are wired and equipped with 17 feature cord circuits. The following features are provided on the local cord circuits; keyless automatic listening, two party divided machine ringing, with individual two button ringing keys, dark keyshelf, line lamp recall, removal of busy test, single disconnect on answering cord, revertive ringing tone and automatic peg count.

The M. D. F. consists of ten verticals of Cook L type and is equipped with heat coil lamps and alarm signal. The power equipment is located in the terminal room. The main storage battery is an Exide Emgo 9 and is charged with a Tungar full wave rectifier on a trickle charge basis. Two No. 36-A Kellogg pole changer ringing machines furnish the ringing current. The power board is a floor type of asbestos ebony, equipped with necessary switches, fuses, and meters. Two ringing interrupters are installed—one arranged for 24-volt operation for emergency purposes. These interrupters are wired so that if the commercial power should fail, the emergency machine operating from the main storage battery automatically starts and continues to run until the regular interrupter operating from the 110 volt lighting circuit starts again.

The Scotia Telephone company also installed Kellogg Common Battery telephones of the latest type in place of the obsoleted magneto equipment. Needless to say, subscribers of Festus are very well pleased with the new, compact Kellogg common battery telephones as they are quite an improvement over the old magneto sets that they had for so many years.

Operators at their positions on the new 12-1600 Masterbuilt switchboard that was recently installed in the Scotia Telephone Company's Festus exchange

(*Continued on page* 42)

DUTCHMAN INVENTS AID IN RADIO TELEPHONING

An important invention in the radio field has been patented by W. P. C. Vanderhorst of Rotterdam, Holland.

It permits the simultaneous broadcasting of several radio-telephone conversations over one transmitter and one wave length from any given point, combining this with secrecy.

Of great additional importance is the fact that the wave length is not widened, hence there is no interference with other transmitters. The synchronization of television, which is a difficult problem in that field, could be simplified with the use of the new invention, it is felt here.

Photoelectric cells are employed in the device.

The inventor is one of the pioneers in the radio field in Batavia and the Dutch East Indies.

Engineers of the Bell Telephone laboratories in New York have declined to comment on the invention.

The engineers pointed out, however, that the simultaneous transmission of several messages over a single broadcasting station had never been found by American engineers to yield any economy in the space required in the ether, in the transmitting power or in the apparatus, per conversation.

It was quite as cheap, they inferred, to establish entirely separate broadcasting stations and send out the messages or conversations independently.

Lacking full information on the methods used by the Dutch inventor, the engineers were not inclined to discuss further the reported achievement. They explained, however, that secrecy in conversations was already available and in use in the United States for radio purposes.

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Relation of Radio to the Telephone

Similarities Between These Two Methods of Communication and Design Details Which Each Has Borrowed from the Other Were Discussed by Ray H. Manson, Vice-Pres. and Chief Engineer, Stromberg-Carlson Telephone Mfg. Co., in Address Before National Independent Convention.

Today, everyone is interested in radio broadcasting from the entertainment standpoint. The majority of people listening to radio also are subscribers to telephone service, but only a handful of this big group of people, realize that the high quality of present telephone service is due primarily to the three element vacuum tube and other radio developments.

Prior to 1915, it was not possible to carry on telephone conversation across the United States from the Atlantic to the Pacific Coast. The three-element vacuum tube, built up around the designs submitted to the Bell Telephone laboratories by Dr. Lee DeForest in October, 1912, was mainly responsible for bridging the United States with commercial telephone service. All of us know of the more recent developments of radio which allow conversations to be carried on from our offices and homes to offices and homes in foreign countries. Thus, through the use of radio and the vacuum tube, telephony has improved in quality and has extended its commercial service to all parts of the world.

Both the A. T. & T. company and the Bell Telephone laboratories have recognized from the start the importance of radio in the improvement of telephone technique, and the extending of the service to larger territories. In the Independent field, the company with which I am connected early recognized the importance of radio in connection with telephony and ten years before broadcasting was made commercial and three years before the vacuum tube telephone repeater was introduced into the telephone circuits of the Bell company, this organization manufactured and marketed radio head sets for amateurs and commercial operators.

This early start in radio stimulated development of improved audio systems and loud speakers, and through these researches notable improvements have been made in standard types of telephone equipment.

Radio also has benefited by its close relationship to telephony, by incorporating many of the design details which had been developed through long experience in manufacturing telephone equipment for the exacting requirements of public service corporations.

The close relationship of radio to telephony and vice versa is best comprehended when we reduce the two systems to that of general principles. In both radio and telephony, the complete system is nothing more than an electro-acoustic transmission network in which sounds are transmitted by electrical means. In the telephone system, sounds (speech) are converted into electrical currents at the telephone transmitter and these currents are carried by wires to the telephone receiver at the distant end of the circuit where they are turned back into sound. In the radio broadcasting, the sole function of the entire system is to transfer sounds from one place to another, but in this case the system is more complicated, as one portion of the connecting link between the broadcast station microphone and the loud speaker at the receiving end is through space, without any wires to guide the electric currents. In the case of telephony, wire circuits control the exact destination of the sounds, whereas in radio the transmission through space makes it impossible to control the exact destination of the sound, and as a consequence any number of listeners can "tune in" to the broadcast signal and reproduce the transmitted sounds in their homes.

Until the advent of radio broadcasting, there was no commercial demand on the telephone companies for what is now known as "high quality telephone circuits," such as are now used in network radio programs. This was due mainly to the fact that the designers of telephone apparatus and telephone circuits were more concerned in getting intelligibility of speech than in obtaining complete naturalness of reproduction. Also, the regular telephone circuits are intended for the transmission of voice only and the range of audio frequencies required for commercial conversations are relatively short as compared to the range of audio frequencies required for the transmission vocal and instrumental music.

These high quality radio program circuits were first designed to pass audio frequencies from about 100 cycles per second (approximately one octave below middle "C" on the musical scale) to 5,000 cycles per second, which is somewhat higher than the fundamental frequency of the highest pitched note on the piano scale. In commercial telephone circuits, which carry speech only, a much shorter range of from about 250 cycles to about 2,750 cycles has been considered satisfactory.

The demand for better audio quality on the part of radio broadcasting has recently brought about still further improvements in high quality by telephone circuits for radio use. Special circuits in the recently installed New York-Chicago cable allow a flat response extending from approximately 40 cycles to 8,000 cycles. With this telephone circuit improvement, the transmitting end of a radio broadcasting system now are capable of giving a high quality of transmission which will reproduce faithfully and with a high degree of naturalness, vocal and instrumental music, all kinds of speaking voices, and odd noises which do not come under the heading of music or speech.

Again, it is seen that through the demands of radio broadcasting not only have the telephone circuits been greatly improved from the quality transmission standpoint, as well as long distance coverage, but the details of the design of all of the apparatus entering into these circuits have likewise been vastly improved over that required in telephone circuits prior to the advent of radio.

Inasmuch as both telephony and radio deal with sound, it is natural to expect that much research has been done in telephone laboratories on this most important subject. For example, in the Stromberg-Carlson laboratories, acoustical research has been going on for many years. A special sound room and special testing instruments have been devised for carrying on this research work and original outdoor measurements have been conducted as a check on the inside laboratory tests. The data accumulated through a long period of experience in these acoustical laboratories has resulted in determining the principles involved in the reproduction of sound in the commercial types of broadcast receivers and has resulted in the increasing of the audio range, as well as the smoothing out of the reproduction, so as to avoid resonant peaks and other disturbing elements.

It is not out of place to mention here a few semi-technical facts on sound systems which will explain some of the problems of the acoustical engineer. For example, resonance is that property of a vibrating system which enables it to be readily set into motion at its *natural frequency*. A sharply tuned resonant system will vibrate vigorously when excited by a relatively small force having the same frequency as that of the

system, but will respond only slightly to the same force at other frequencies. Resonance may occur in mechanical, electrical or acoustic systems.

An example of mechanical resonance at a very low frequency is the familiar playground swing, which may easily be set into regular motion only by timing the pushes so that they occur in stop with the natural period of the swing.

Resonance in an electrical system is illustrated by the behavior of the tuned circuits in a radio receiver, whose natural frequency may be adjusted to respond only to that of a desired broadcast station.

Acoustic resonance may occur in a partially closed air chamber, such as the space behind a loud speaker in a radio cabinet. In such a case, a reproduced tone whose frequency corresponds to the natural frequency of the enclosed mass of air will be exaggerated in loudness.

There are two types of distortions produced by resonant systems, as follows:

(a) Frequency distortion, because of the exaggeration of frequencies falling at or near the natural frequency of the system.

(b) Transient effects. These may occur when the system is driven forcibly by signals of a frequency other than its natural frequency. Suppose a short pulse of such a signal be admitted to the system. The system first vibrates a few times at its own natural frequency, these vibrations being superimposed on those forced by the driving frequency. Then it settles down to response to the driving frequency only. When the signal stops, however, the system continues to vibrate momentarily at its own natural frequency. These "start and stop transients" particularly affect rapidly changing signals such as speech and music and produce a type of distortion which is very difficult to measure instrumentally.

The above discussion indicates why resonance should be avoided in the sound frequency range of electro-acoustic transmission systems.

While in telephony an audio frequency range of about 300 to 3,000 cycles is satisfactory for recognization of speech sounds, complete naturalness is lacking, due to the preponderance of high frequencies, compared to the available low frequencies.

The ideal range for speech naturalness and intelligibility would be approximately 90 to 5,000 cycles. This happens to be the outside audio range limits for the majority of radio receivers now in use. Reproduction of frequencies above 5,000 cycles, in the present broadcast system set-up, is productive of disturbing elements which detract from the program.

The lower limit of the audio range is dependent on several controlling factors, one of which is the baffle area presented by the radio receiver cabinet, which houses the modern type of electrodynamic speaker.

A baffle is nothing more than a partition for preventing circulation of air between the two sides of a loud speaker diaphragm. The air must alternately be *compressed* and *rarefied* in order to initiate sound waves in it. In order to do either of these things it is necessary to confine or restrain, in some manner, the air immediately adjacent to the diaphragm.

Consider a diaphragm without a baffle. If the vibrations of the diaphraghm are very rapid, as when producing a relatively high-pitched note, the inertia of the air itself, due to its definite mass, will cause it to resist the motion of the diaphragm sufficiently to produce compression. Now, suppose the diaphragm is to vibrate at a slow rate, as when producing a deep bass note. Consider its forward motion. The air has time, in this cause, to move bodily and to slip around the edge of the diaphragm to the rear side to take the place of that which has tended to follow the diphragm forward. The air thus merely evades the thrust of the diaphragm and is not compressed, with the result that no sound is radiated.

Now, imagine the baffle to be put in place. The air can no longer find a short and easy path between the sides of the diaphragm; in order for it to flow from one side to the other it would have to pass out to the edge of the baffle and back on the other side, which would involve the motion of a large mass of air. The greater inertia of this larger mass causes it to resist even the slower motion of the diaphragm sufficiently to be compressed and to produce sound.

The larger the baffle, the lower the frequency which can be reproduced. This follows from the above discussion; the slower vibrations corresponding to the lower frequencies require a greater mass of air to resist the diaphragm motion in order that the inertia may be great enough to allow compression to take place. This requires a larger baffle to restrain a larger mass of air from moving freely.

In the modern radio receiver, the enclosing cabinet serves as a box type baffle, and while it is not as good in some respects as a flat baffle, it can be scientifically designed to give excellent audio reproduction when fitted with a correctly designed loud speaker unit. Recent acoustical laboratory studies show that the front area of the cabinet is of greater importance in the smooth reproduction of the lower audio frequencies than the length of circulation path, as applied to box type baffles. The box type baffle introduces acoustical resonance which tends to exaggerate a short range of sound frequencies and produce what is popularly known as "rain barrel effect." This requires special treatment to remedy, such as leaving the back and bottom of the cabinet open. Now as to the low frequency cut-off produced by commercial forms of radio cabinets. Laboratory tests show that some of the small "midget" type cabinets omit all fundamental frequencies below middle "C" on the musical scale, and that the largest console cabinets cut off at about 60 cycles. Thus, the larger the cabinet, the greater the possibilities of true low frequency response.

It is fortunate that the human ear is so constituted that the audio range now practical from the broadcast system standpoint, is adequate for satisfactory reproduction of both speech and music with a high degree of naturalness.

This research for better ways and means for obtaining higher quality of reproduction in radio broadcast receivers has taught telephone engineers how to improve the apparatus entering into the transmission of speech in telephone circuits. Furthermore, the solving of the problems involved in the production of high quality radio equipment has resulted in the introduction of more advanced manufacturing methods and the inauguration of more complete and exacting tests for quality than have been considered necessary for straight telephone production.

In telephony, the same as in radio, the main object is to transmit sounds from one location to another with a *high degree of fidelity*. The public has but little interest in the mechanism and circuits employed in connecting the transmitting and receiving points, so long as telephone connections are made quickly and maintained without interruption. This prompts the statement that the type of telephone instrument, the type of telephone switchboard and, in fact, the design details of the intercommunicating apparatus, which has to do with signaling and switching, are of secondary importance from the standpoint of the telephone subscriber.

As a fitting conclusion to this statement regarding the relation of radio to telephony, it is not out of place to repeat that the design and manufacture of radio equipment in telephone factories has resulted in marked improvement also in the design of the telephone equipment made in those same factories. Thus, instead of being a diverting influence in a telephone manufacturing organization, the successful handling of radio design and manufacturing problems has been productive of outstanding improvements in the telephone products.

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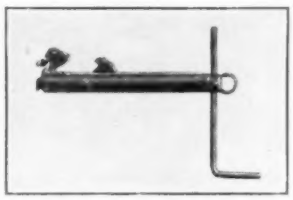

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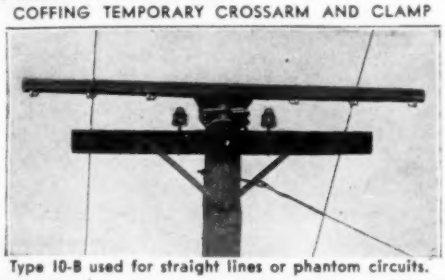

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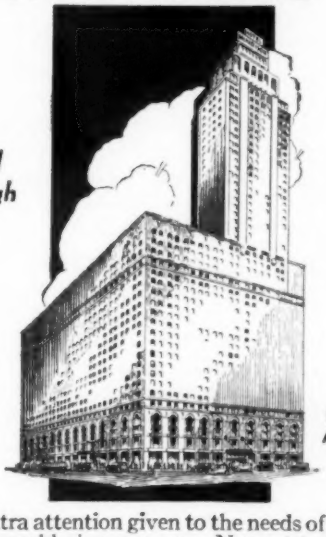

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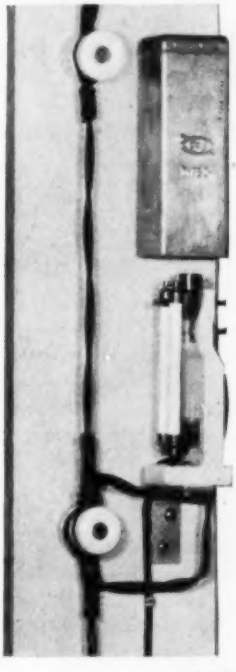

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Inter-Mountain Co. Installs "All-Relay"

North Electric Manufacturing Company, Galion, Ohio, Provides "All-Relay" Equipment for Exchange at Butler, Tenn., Owned by Inter-Mountain Telephone Company, of Bristol, Tenn. Tour of Inspection After Fourteen Months of Service Finds Many Delighted Subscribers

Amid the invectives hurled at public utility companies in these days of business readjustment, it is not the least discouraging to have our faith in ourselves as telephone men bolstered by outstanding examples of the spirit of true service demonstrated by telephone companies in their endeavor to live up to the highest interpretation of the word entrusted to them in their telephone franchise.

Such is the example set by the Inter-Mountain Telephone company of Bristol, Tenn., whose constant endeavor, under the able presidency of W. N. McAnge, Jr., is to consider the service from the subscriber's standpoint, introducing only such alterations as contribute to the betterment of the service, the increasing of facilities, and the beautifying of the right-of-way. Cable runs aggregating many miles are seen where lines of lesser beauty and poorer transmission prevailed; toll leads are reconstructed with better timber and modern hardware; and last but not least, iron circuits are giving place to copper.

Bordering upon this territory of progressive improvements lies the little town of Butler, Tenn., a community with a population of some 700, variously employed in agriculture and lumber milling with its associated activities. A magneto telephone system owned by local interests served this community with a total of 66 stations and a single iron toll circuit to Elizabethton, the Queen City of Tennessee's Happy Valley.

Forced by economic considerations to operate a declining magneto plant and switchboard, the type and quality of service in Butler were not conducive to warranting an application for higher rates, nor could the revenue do more than cover operating expenses. This situation imposed a hardship, not alone on the Butler subscribers, but also on the nearby telephone users in their toll connections with Butler. These users, accustomed to every consideration in service from the Inter-Mountain company, made it imperative that some steps be taken to improve the Butler difficulties, and what more natural than that the Inter-Mountain company should purchase all interests in the Butler company.

This purchase was consummated in the early Spring of 1931, whereupon the Inter-Mountain company became faced with the problem at first hand. As a result new cable was installed in Butler, the iron circuit to Elizabethton rebuilt with new poles and arms, and a new copper circuit added. Then came the question of what to do to improve the service from the operating standpoint and to reduce operating expenses.

Having heard much about "All-Relay" equipment, including not a little said in lighter vein concerning its claims to unattended operation, Mr. McAnge decided to settle this point once for all by a personal investigation. The names and locations of contiguous "All-Relay" exchanges were ascertained and a trip arranged for a party consisting of Mr. McAnge, W. G. Griffin, general plant manager of Inter-Mountain Telephone company, and four officials of the Bell Telephone companies, namely, J. G. Bradberry, superintendent of construction in the Carolinas, Southern Bell Telephone & Telegraph company, C. E. Graff, chief engineer of Chesapeake & Potomac company of Virginia, E. B. Harrington, equipment building engineer, Chesapeake & Potomac company of Virginia, and F. M. Craft, chief engineer, Southern Telephone & Telegraph company.

The results of this trip, which covered a number of "All-Relay" exchanges operated by the Central Carolina Telephone company in North and South Carolina, are best given in Mr. McAnge's own words written to a friend:

"We have only recently given any thought to the North "All-Relay" type equipment. It will be of interest to you to know that we recently made a trip of inspection in company with several engineers, to a number of the Central Carolina company's exchanges in North Carolina. We visited two exchanges that had been in operation fourteen months without a single case of central office equipment trouble. One of the others had developed one case due to a faulty condenser, and another had had two cases of trouble, both of which, I believe, were caused by lightning. This is certainly a splendid testimonial for the relay type equipment. While in these exchanges I called a number of the subscribers, some of them being as far as twelve miles from the central office and served on iron wire. I found the transmission perfect and all of the subscribers interviewed were delighted with the service."

Early in August of the same year, a complete installation of "All-Relay" equipment was made in Butler by the North Electric Manufacturing company. A 100 line "All-Relay" exchange equipped with 70 lines and harmonic ringing now serves this community, completely solving all past difficulties of service and transmission. That this solution is complete is indicated by the results of a canvass recently made of the subscribers in Butler, concerning which Mr. McAnge has written to his friend as follows:

"The Butler exchange has been in operation for four months, and we have never had a single case of central office trouble. A recent canvass was made of our subscription list in this exchange by my assistant, Mr. Meadows, and the subscribers carefuly canvassed as to their opinion of the service rendered by the relay type dial exchange, were unanimous in their praise of the service. During this canvass fifty people were interviewed, and not a single subscriber made a complaint, but the general statements were "The service is fine," or "We could not ask for better service." In this exchange we are operating some ten-party rural lines eight miles in length, and we have had no trouble whatever from dialling or ringing, and the transmission has been entirely satisfactory."

It may also be added that a noteworthy, if not enviable, increase in stations has been experienced since the cut-over to "All-Relay" which has added over 50 per cent to the subscriber list.

Since the Butler installation, a second "All-Relay" exchange has been cut into service for the Inter-Mountain Telephone company at Sugar Grove, Va., and another 100 line exchange is now on order for Glade Spring, Va.

COWETA-PORTER EXCHANGE ELECTS OFFICERS

The annual meeting of the Coweta-Porter Telephone company was held at Coweta, Okla., February 1, 1932.

The following officers were elected to serve for one year: P. Kerr. Higgins, president and general manager; Wray Lees, vice-president; Ethel Cox, secretary, and G. E. Higgins, treasurer.

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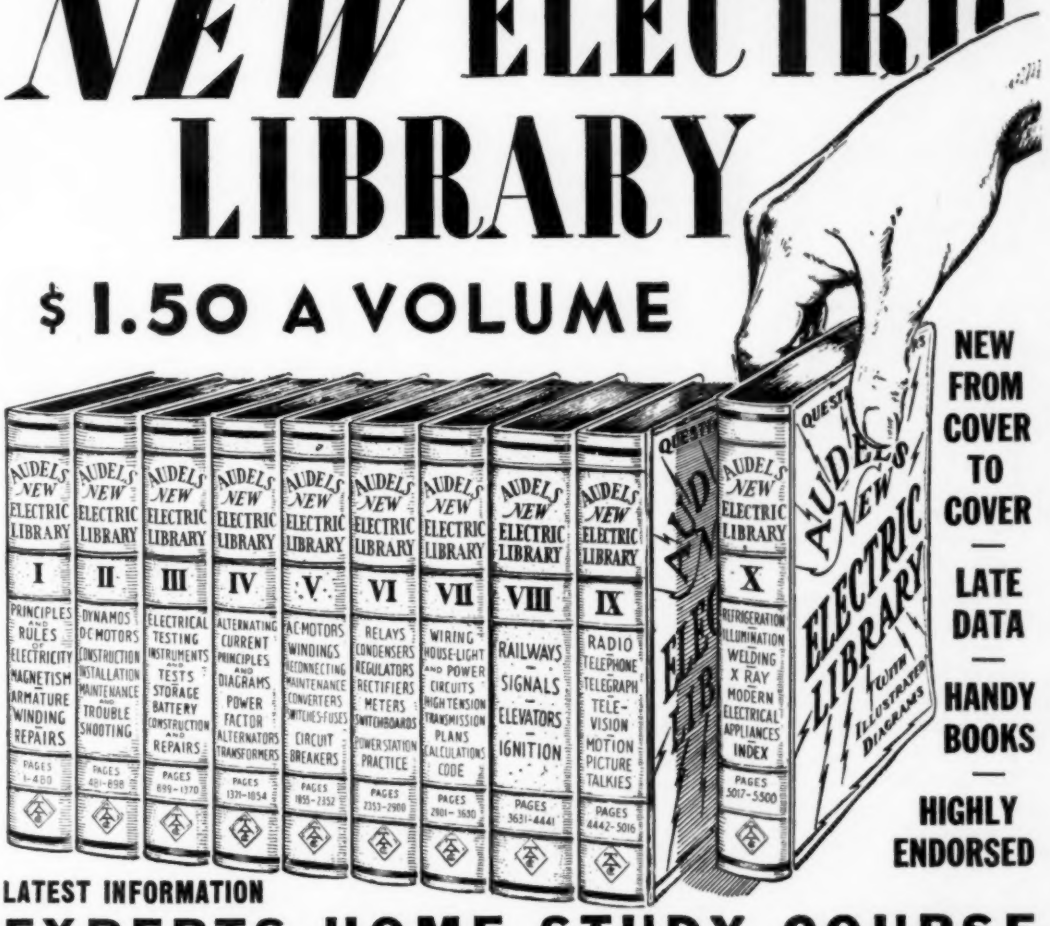
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With Manufacturers and Jobbers

CONVERTS TELEPHONE RELAY INTO POWER RELAY

Converting the standard telephone type relay into a power relay for the handling of many hundred watts of energy, the latest electrical contact device, may truly be termed an electrical hair trigger. This device developed in Germany and now made available to American telephone and electrical workers, opens up an entirely new field by way of power control over telephone lines.

Briefly, the Burgess Vacuum contact comprises an evacuated glass bulb containing a pair of copper contacts actuated externally by an extended glass arm. The operating principle is based on the flexing action of annealed glass bellows, so that the slightest movement of the extended arm separates the enclosed contacts. Since the contacts are in vacuum, there is no arcing and no corrosion. A movement of .02 inch at the end of the extended arm serves for a positive break of the contacts. The contacts handle up to 6 amperes continuously and 8 amperes intermittently at 220 volts.

The vacuum contact may be mounted on the usual telephone type relay, by means of a suitable strap or holder, with the small movement of the relay armature applied to the end of the extended arm by simple coupling. Thus a few milliamperes of current serve to control several hundred watts of energy passing through the vacuum contact. The circuit is made and broken in a clean cut, instantaneous manner, without chattering or hand-overs even at a speed up to 40 times per second. The life of the device is tens of millions of times. The device is being introduced in this country by the Burgess Battery company, 295 Madison Avenue, New York City.

PURCHASES EQUIPMENT OF STROMBERG-CARLSON

George S. Kramer, Richmond, Ind., has just purchased a complete program service equipment from the Stromberg-Carlson Telephone Manufacturing company for installation in the Hibbard School, Richmond. This system will include amplifying equipment, loud speakers, phonograph unit and announcing microphone.

GRAY BECOMES DISTRICT SALES MANAGER

The appointment of J. R. ("Johnnie") Gray to the position of district sales manager in charge of eastern Pennsylvania and southern New Jersey territory was announced the first of the year by officials of the Four Wheel Drive Sales company. Gray has been connected with the FWD organization for fourteen years in various capacities, eight years being spent in direct sales work in the Wisconsin division. During the past three years he has been in charge of FWD sales in southwestern Wisconsin, with headquarters at Madison.

STROMBERG-CARLSON SENDS CANNON TO COAST

The appointment of F. K. Cannon, export manager of the Stromberg-Carlson Telephone Manufacturing company for the past seven years, to Pacific coast sales manager, has been announced by George A. Scoville, vice president and sales manager.

For almost thirty years Garnett Young and company and its predecessors have represented Stromberg-Carlson on the Pacific coast.

By mutual agreement Stromberg-Carlson has taken over both telephone and radio sales activities while Garnett Young and company will continue to handle the warehousing, servicing, shipping, billing, credit and collection work.

Mr. Cannon, a graduate electrical engineer of the University of Minnesota, has been associated with Stromberg-Carlson 26 years and has a wide knowledge of the telephone and radio industries.

Mr. Cannon will make his headquarters in San Francisco and will have the following men on his staff:

R. G. Bookless, Southern California division, with headquarters at Garnett Young and company, Los Angeles.

Alfred Soulages, Central California division, with headquarters at Garnett Young and company, San Francisco.

William Larkin, Northwest division, with headquarters at Garnett Young and company, Seattle, Washington.

E. C. Kinsey of the Garnett Young and company, San Francisco office, will have full charge of credit work.

Mr. Scoville and Garnett Young believe that this joint arrangement will provide the telephone and radio trade maximum convenience and support, both as to sales and service.

OTTO BERNZ ANNOUNCES PRICE REDUCTION

Otto Bernz company, Inc., of Newark, N. J., manufacturers of furnaces, torches, and tools, announces a reduction in jobbers' prices on almost all styles of "Always Reliable" torches, and on some "Always Reliable" furnaces. This reduction went into effect on January 18.

MASTERBUILT SWITCHBOARD SOLVES PROBLEM

(*Continued from page 35.*)

This new telephone plant serves both Festus and Crystal City, Mo., which have a combined population of about 7,000. Crystal City and Festus are less than a mile apart located on the Mississippi River in Jefferson County, just 37 miles south of St. Louis.

The installation of this equipment was made by C. M. Robinson of the installation department of the Kellogg Switchboard and Supply company of Chicago, under the supervision of R. A. Cooper, district manager of the Scotia Telephone company.

P. K. Higgins, president of the Scotia Telephone company, Mrs. Higgins, Mr. Lee Bessette, inspector for the company, E. R. Sears, and F. B. Knefel of the Kansas City office of the Kellogg Switchboard and Supply company attended the cutover.

IMPROVEMENT IN COMMUNICATIONS RECEIPTS

The statement of estimated traffic of British imperial and international communications discloses a revenue of £410,216 in September, as compared with £334,326 in August. Total receipts for the first nine months of 1931 amounted to £3,506,265 as compared with £4,080,171 for the corresponding period of 1930.

SIAMESE ARMY ADOPTS PORTABLE RADIO TELEPHONE

The Siamese army has made tests with portable telephone apparatus. It has been reported that an order has been placed with a New York firm and that communications will be maintained for military purposes between Pitsanuloke, Chiengmai and Bangkok.

GOVERNMENT TO TAKE OVER ICHANG (CHINA) TELEPHONES

Because of limited capital the Ichang (China) Telephone company has been unable to meet the demand for a better service, and the Chinese ministry of communications has therefore decided to take the telephones of the company under control.

NEW TAX ON TELEPHONE UNITS IN SERVICE IN COLOMBIA

Beginning January 1, 1932, private telephone service, actually in operation or which may be installed in Colombia, are paying a monthly tax one peso (about $0.97) for each apparatus in service, according to provisions of a decree of April 17, 1928. Exception to this tax is made in the case of service provided for on a special contractual basis.

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Dependable battery operation is imperative to uninterrupted telephone service.

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Besides this you have the cooperation of a staff of experts in wire and cable manufacture, trained to value quality above all else—backed by a firm which has been in this one business for over forty years. Write for prices.

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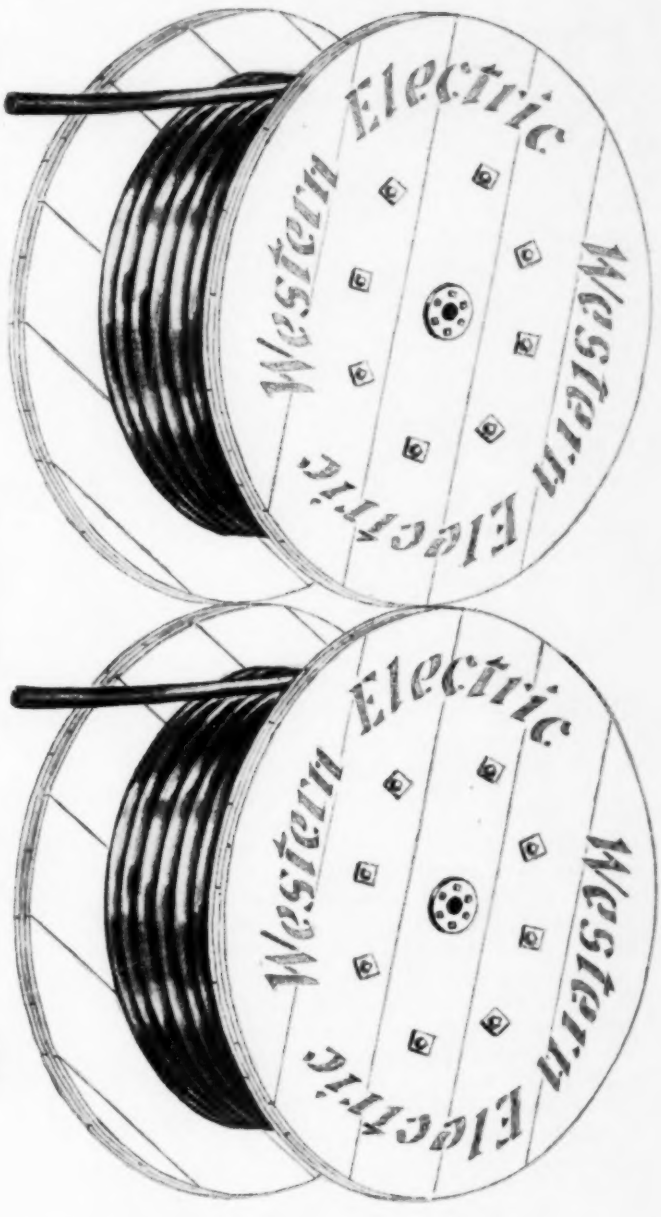

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Introduce Two New Truck Models

[Four Wheel Drive Company Exhibits FWD Trucks at A. R. B. A. Road Show at Detroit, Including New HH6 of Two and One-Half Ton Capacity]

The Four Wheel Drive Sales company of Clintonville, Wis., exhibited two FWD trucks at the 1932 A. R. B. A. road show held in Detroit Jan. 9 to 15. The models shown included a new and more powerful HH6 of 2½ tons and the 1932 six-wheel job of six tons capacity.

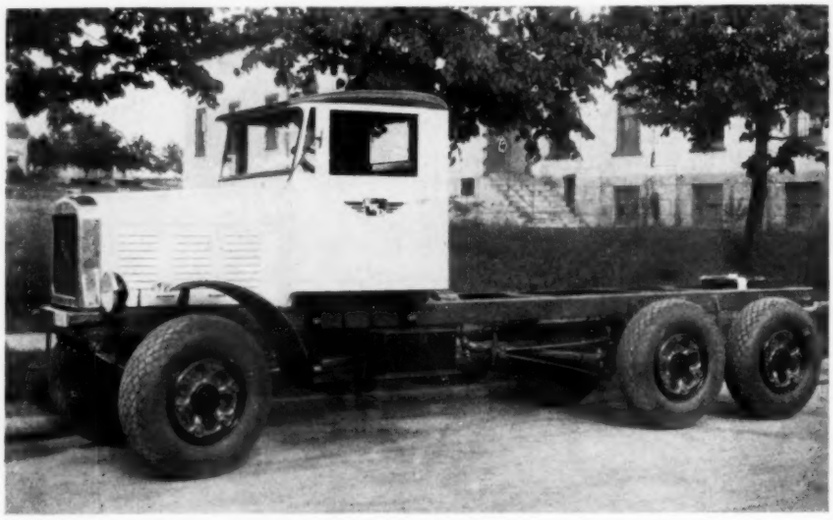
The HH6 is a new job featured especially as a road building and maintaining machine. It is equipped with a dump body and hoist and the latest type power controlled underbody scraper. A powerful motor developing 85 brake horsepower hooked up to all four wheels through a seven-speed transmission insures excellent performance.

The X6 model is a four-wheel drive six-wheeler employing the regular FWD drive, that is, a live front axle and first rear axle with a dead second rear axle. This new truck is greatly improved in appearance over former models and has a number of mechanical improvements as well. The motor and transmission have been lowered considerably making an almost straight line drive between the transfer case and two driving axles. Motor power has been increased with heavier units incorporated all along the driving line. Balloon tires of the 10.50-20 size are used on all six wheels. The low mounted coupe type cab is completely equipped with all the comforts of a pleasure car including a unit instrument panel indirectly lighted.

The following member of the FWD organization were in attendance at this 29th road show and exposition: W. A. Olen, president and general manager; R. H. Schmidt, general sales manager; S. H. Sanford, assistant sales manager; W. M. Hanson, advertising manager; H. M. Daniels, branch manager, New York City, and H. G. Engel, district sales manager.

In addition to the FWD trucks exhibited by the Four Wheel Drive Sales company there was another interesting FWD at the show. A hydraulic controlled Wausau snowplow was exhibited by the Wausau Iron Works on the 7½-ton MT model.

New HH 6 of 2½ tons capacity featured as road building and maintenance machine



Six wheel FWD truck of 6 ton capacity 1932 model

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ESTABLISHED 1904 Formerly Runzel-Lenz Electric Mfg. Co. **CHICAGO**
Specializing in Manufacture of
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FOR ALL CLASSES OF TELEPHONE WORK
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WHEN the Monophone was first designed, the Strowger development engineers approached the problem from two viewpoints. They said, "Let us not only make a telephone whose technical efficiency is beyond compare, but let us also put ourselves in the place of the telephone user, and design the kind of telephone HE would like—incorporating those qualities HE prefers."

This attitude produced the Monophone. That it exemplifies those things the user desires in his telephone, has been proven by its world-wide acceptance and adoption. Surpassing beauty, convenience, ease of operation and clarity of transmission — all these have made the Monophone a "best seller" to the public. The use of Bakelite has made these qualities possible without sacrificing strength, durability and lasting finish, all so important to the telephone company.

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ANNUAL REPORT OF ILLINOIS BELL TELEPHONE

While revenues of the Illinois Bell Telephone company for the year 1931, in common with those of most other industries, were adversely affected by general business conditions, the company was able to improve the quality of its service and, by careful management, finish the year with a margin of earnings above dividend requirements.

The annual report of the company to its stockholders issued for the directors by President F. O. Hale on February 1 shows net earnings for the year of $16,149,372, or at the rate of 5.58 per cent on the average book cost of the physical property, compared with 6.21 per cent for 1930. Net profits were $12,816,907, which is $8.54 per average share of capital stock outstanding and compares with $9.98 per average share for 1930.

The number of telephones connected was 227,575 and the number disconnected 284,116, resulting in a net station loss of 56,541. However, at the end of the year the total number of telephones in service was 15,000 higher than at the beginning of 1929 and about 175,000 higher than five years ago. In addition to connections and disconnections, 175,068 telephones were moved due to subscribers' changes of address.

Gross expenditures for additions and betterments during the year amounted to $20,273,845. The standard of maintenance has been held at a high level, says the report, and as a result the plant is in excellent condition.

The daily average of local telephone calls was 5,891,000, a decrease of 4.4 per cent from 1930. Toll and long distance messages averaged 221,000 per day, a decrease of 6.1 per cent.

POSITION WANTED—Telephone engineer with years experience desires temporary or permanent position with reliable company. C. M. M., care Telephone Engineer.

WANTED — Position with telephone company. Have had fourteen years experience in plant, traffic and commercial work and in organizing small companies. I have been employed the past twelve years by the same company and am at present without employment due to the fact that this company has been sold. I am married, thirty-two years of age and will go any place. O. S., % Telephone Engineer.

WANTED—To buy an exchange with 300 to 1,000 subscribers. Located preferably in the middle states. Furnish details as to plant and price in letter. J. M., care T. E.

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Stromberg-Carlson Latest type 4-bar generators with Crank & Screws @	2.00
Kellogg or Stromberg 1600 ohm self-contained ringers with gongs @	1.50
Kellogg No. 2696 type 4-bar 1000-1600 or 2500 ohm compacts @	8.00
Kellogg No. 28 Cast head desk set with W. E. No. 240 external post connection 3-bar 1000-1600 or 2500 ohm signal set @	8.00
Stromberg-Carlson No. 11 drops and jacks (fit No. 105 board) per strip of 5	7.00
Western Elec. No. 317 3-bar 1000-1600 or 2500 ohm Bdg. compacts @	6.60
Western Elec. No. 240 external post connection 3-bar 1000-1600 or 2500 ohm Bdg. hotel sets with W. E. Trans. & No. 122 Rec., @	4.75
Kellogg No. 22 Transmitters with backs and Mouthpiece @	1.10
Western Elec. No. 323 Transmitters with back & Mouthpiece @	1.25
Kellogg or Western Elec. Local Battery Ind. Coils @	.40
Monarch Local Battery Ind. Coils @	.35
Western Elec. No. 20 desk set with W. E. No. 315 3-bar 1000-1600 or 2500 ohm inside connection signal set @	10.00

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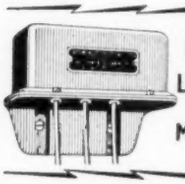

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